

Faculdade de Engenharia da Universidade do Porto



“On the development of network commitment in top-down innovation networks:
Towards a practical framework for network creation
and sustained development.”

by

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...for Rita

and my parents Clara and John

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Abstract

On the development of network commitment in top-down innovation networks: Towards a practical framework for network creation and sustained development.

Innovation networks have repeatedly been demonstrated to increase the economic and innovation output of firms and economic regions. For this reason, many attempts have been made by policy makers and private firms to create innovation networks intentionally, from a top-down perspective. An underlying problem is that these more formal attempts at establishing networks have, more often than not, resulted in network failure. In the literature on inter-organizational networks, the concept of network commitment is relatively new and unexplored, and has been linked to increased network performance and sustainment over time.

Through a longitudinal, embedded, multi-case study, which focuses on the creation and development of seven network cases created under a specific policy incentive in Germany, the present research analyses how network commitment can be influenced through network management, thus increasing the chance of network sustainment in the long run. The main drivers for network commitment are identified as Present Value, Social Mechanisms and Future Expectations. It is shown how a network manager could - through the network context, the network design and the network operation - influence the network commitment drivers and subsequently network commitment itself.

By following the design science paradigm, this research concludes with a framework which serves as a practical tool for the creation and development of top-down innovation networks. The findings are proved to be relevant both for

practice (namely for managers and policy makers) and for the theory of network creation, network development and network commitment.

Resumo

**Sobre o desenvolvimento do compromisso de parceiros de rede, em redes de inovação intencionais:
Uma metodologia pratica para a criação e desenvolvimento sustentado de redes.**

Tem sido repetidamente provado que redes de inovação funcionam como um importante instrumento para a fomentação de inovação e desenvolvimento económico de regiões e empresas. Devido a este facto têm sido levadas a cabo várias iniciativas, para a criação intencional de redes de inovação, por decisores políticos e empresas privadas. No entanto, um problema subjacente é que este tipo de redes criadas intencionalmente tendem a fracassar. O conceito de compromisso de rede é relativamente recente e inexplorado na literatura sobre redes de inovação. Adicionalmente tem sido associado com aumento de desempenho e sustentação de redes a longo prazo.

Através de um estudo multi-caso longitudinal embutido, com o foco na criação e desenvolvimento de sete redes estabelecidas no âmbito de um incentivo específico à indústria Alemã, esta investigação analisa como o compromisso de rede pode ser influenciado por medidas de gestão da rede. Isto permite aumentar as chances de sustentação da rede a longo prazo. Os principais fatores que influenciam o compromisso de rede são Valor Atual, Mecanismos Sociais, e Expetativas Futuras. Subsequentemente é demonstrado como um gestor da rede pode influenciar o compromisso de rede através do contexto, desenho e operação da rede.

Ao seguir o paradigma de design science, este trabalho de investigação apresenta uma metodologia que serve como ferramenta pratica para a criação e desenvolvimento de redes de inovação intencionais. Esta metodologia é

demonstrada ser relevante tanto para a prática de redes – ou seja para gestores e decisores políticos – como para a teoria de criação e desenvolvimento de redes, assim como para o conceito de compromisso de rede.

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List of Acronyms

BMWi - Federal Ministry for Economic Affairs and Energy

LED - Light Emitting Diode

NAO - Network Administration Organization

R&D - Research and Development

RG - Research Goal

RQ - Research Question

SME - Small to Medium sized Enterprise

RTD - Research, Technology or Development institution

UAS - Unmanned Aerial Systems

ZIM - Zentrale Innovation Mittelstand

Chapter 1 - Introduction

1.1 Problem Statement and Motivation

Since Porter's (1990) seminal work on the competitive advantage of nations, much attention has been given to clusters and innovation networks both in academia and in practice. The finding that networks increase innovation and economic performance of regions (Etzkowitz and Leyersdorf, 2000; Porter, 2000) and firms – especially SMEs (Koschatzky and Sternberg, 2000; Tomlinson and Fai, 2013) - has since been repeatedly confirmed in the literature.

Not surprisingly, over the last two decades, governments have focused on establishing policy-implanted innovation networks – or top-down innovation networks - in order to stimulate innovation and economic performance of companies and regions (Eickelpasch and Fritsch, 2005; Greenfield et al., 2013; Human and Provan, 2000; Olsen et al., 2012; Thorgren et al., 2009). It is therefore not surprising that the European Cluster Observatory¹ currently lists over 3600 clusters and networking organizations. Other initiatives such as the Europe Enterprise Network² have been created with the goal of establishing stronger networking and innovation activities among SMEs in Europe.

Efforts by private or public institutions have been made to both create (top-down) and support existing (bottom-up) innovation networks (Lindqvist et al., 2013; Wincent et al., 2013), however it has been repeatedly acknowledged that bottom-up innovation networks consistently outperform top-down innovation networks. According to Huggins (2001, p. 453) “*Where network initiatives are*

¹ <http://www.clusterobservatory.eu>

² <http://een.ec.europa.eu/>

able to draw-in a critical mass of committed firms over a sustainable period, networks can act as an effective and important instrument for economic development". In addition, top-down created networks are more prone to failure than bottom up networks (Formhold-Eisebith and Eisebith, 2005; Huggins 2001). Huggins (2001) reported that 90% of formal network attempts fail. More recently, despite advances in network management, the failure of top-down networks is still an unresolved problem (Shrank and Whitford, 2011; Thorgren et al., 2009; van Raaij, 2006). An underlying problem is that it remains unclear, both in academia and in practice, how top-down networks can evolve into sustained forms. This study defines a sustained network as a network supported by its members and activities, not by the initial policy-incentive.

Previous studies on the creation and development of top-down networks have mostly focused on the practices, processes and structures leading towards either successful or unsuccessful outcomes (i.e. Batternick, 2010; Gausdal, 2013; Olsen et al., 2012; Thorgren et al., 2009). Arguably, a network achieving positive outcomes while highly supported by external policy incentives, does not necessarily indicate that it is going to be sustained in the long run. Since networks achieving sustained collaboration have been shown to achieve improved results (Huggins, 2000; Human and Provan, 2000; Roxenhall, 2011; Williams, 2005), it is surprising that no such studies have focused on achieving network sustainment.

Extant literature suggests that networks with committed network partners have a higher chance of becoming sustained (Human and Provan, 2000; Persson et al., 2011; Provan et al., 2012). Kramer et al. (2013) and André sen et al. (2012) focus on network commitment as a core component for network resilience,

sustainment and subsequent positive performance. Both studies recognize that network commitment is, an under researched topic, and that further insights into network commitment will have important impacts for network creation.

Given the importance of a top-down innovation network becoming sustained in order to deliver good results (Huggins, 2001; Lindqvist et al., 2013) and the connection between network sustainment and network commitment, this thesis focuses on the drivers for network commitment, and how network management can be used to increase the commitment of network partners in a top-down innovation network.

1.2 Goals and Research Methods

The goal of this research is to fill the previously identified knowledge gaps regarding the development of network commitment in top-down innovation networks. Findings are expected to have practical implications by allowing network managers and practitioners to develop top-down networks with committed network partners thereby increasing the chances of obtaining sustained networks with higher performance. The goals of this thesis are as follows:

RG1 – To identify the drivers for network commitment in top-down innovation networks;

RG2 – To assess how previously identified drivers for network commitment can be influenced by network management;

and finally,

RG3 – To develop a method for the creation and development for top-down networks with committed network partners.

These research goals are addressed via a seven explorative longitudinal embedded multi-case studies (Voss et al., 2002; Yin, 2009) focusing on the creation and development of seven top-down innovation networks, over a period of over three years. All networks are active in different industries, and are created under the same policy incentive ZIM-NEMO³, available for SMEs and research institutes in Germany. Principles from design research paradigm (van Aken, 2005) are finally employed to develop a practically applicable framework for the creation and development of top-down innovation networks.

Aligned with the research goals the research questions driving this research are:

RQ1: *“What are the drivers for network commitment in top-down innovation networks?”*

RQ2: *“How can network commitment drivers be influenced through network management?”*

RQ3: *“How to create and manage top-down innovation networks with committed partners?”*

The research design is explained in detail Chapter Three.

1.3 Scope

It is important to state that the aim of this thesis is not to evaluate the policy initiative under which the analyzed network cases were created. The policy initiative simply provides a controlled context under which the differences in the

³ http://www.zim-bmwi.de/Kooperationsnetzwerke-old/Vorlaeuferprogramm-ZIM-NEMO/copy_of_netzwerkprojekte

network cases can be compared. The goal of this study is to focus firstly on the development of network commitment and subsequently to focus on the management activities that shaped the development of the network commitment in top-down goal-oriented innovation networks.

A top-down goal-oriented innovation network is defined as goal-oriented organizational form, fostered intentionally, composed of linked organizations (e.g., firms, universities, government agencies) that create, share, acquire, and integrate the diverse knowledge, skills and resources required to create new technologies for new products or services and bring them to the market.

While it is shown through validation with experts that most of the findings from this study can be applied to clusters, it is important to state that the innovation networks analyzed for this case study are not clusters. Contrarily to the networks featured in the case studies, clusters are networks that span a certain economic region (Porter, 2000). Furthermore, activities offered by cluster initiatives tend to aim to not only promote networking and innovation, but also to actively strengthen the region in which they are active by providing activities to develop human capital, and develop infrastructures (Lindqvist et al., 2013).

The innovation networks analyzed for the purpose of this study, along with the underlying policy initiative, are described in detail in Chapter Four.

1.4 Thesis Outline

This thesis is structured in eight chapters. The thesis structure can be seen in Figure 1.1. Chapter Two performs review of the literature, and frames the concepts of goal-oriented networks, top-down and bottom up-networks and innovation networks. A survey of the literature on network management is

included, followed by a detailed discussion of the concept of network commitment.

Chapter Three frames the research paradigm and provides a detailed description of the research design. An exploratory conceptual framework is also presented based on the literature review from Chapter Two. The different steps and tools used in the research are also explained in detail.

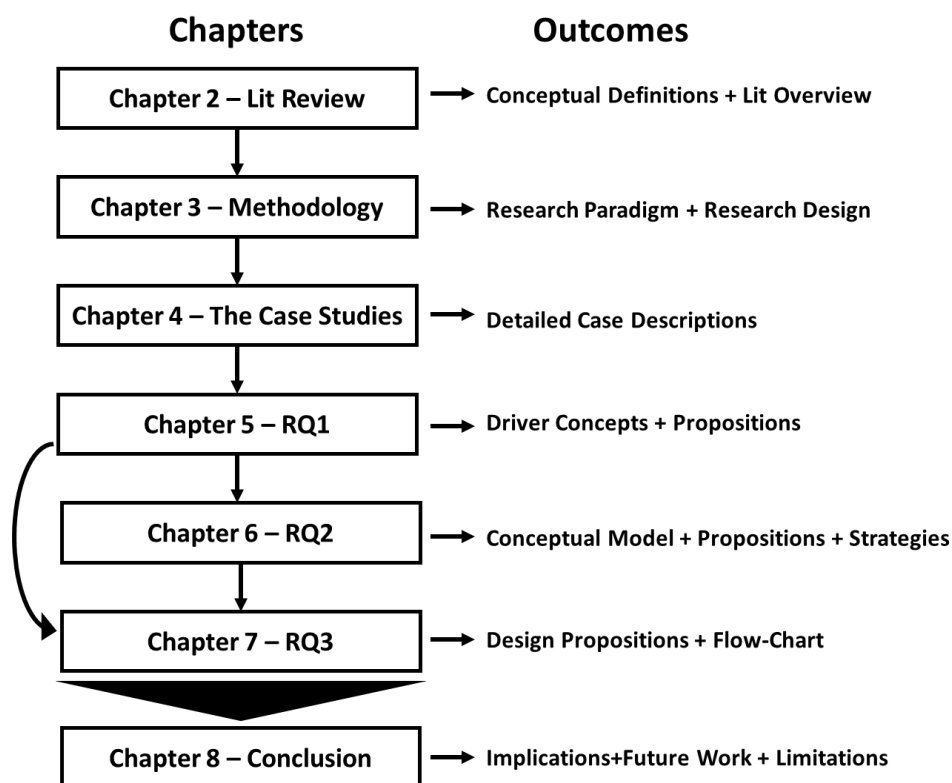


Figure 1.1 - Thesis Overview

Chapter Four provides a detailed description of each network case study along with an overview of the policy incentive under which each network was created.

Chapter Five presents the analysis and findings related to the first research question. Network commitment drivers are identified as three distinct concepts namely present value, social mechanisms and future expectations. Through

discussion with the literature, nine propositions are developed.

Chapter Six presents the analysis and findings related to the second research question. This chapter starts by building on the literature review on network management in Chapter Two and findings from the case studies in order to develop a conceptual model for categorizing network management. This is followed by an analysis of how the concepts identified in Chapter Five were influenced by network management. Finally, based on evidence from the case studies, this chapter identifies and describes three strategies for the creation and development of innovation networks.

Based on the design science paradigm, Chapter Seven builds on the findings from Chapter Five and Chapter Seven, and develops a prescriptive framework as a tool aimed at practitioners looking to create and develop innovation networks. The prescriptive framework comes in the form of design propositions and a flow-chart. Practical relevance of the tool is established via a focus group with 10 network managers. Finally, the tool is validated through interviews with various network managers. In order to assess the external validity of the tool 8 network managers from Portuguese clusters are included as network experts.

Finally, Chapter Eight sums up the academic and practical findings, and discusses the broader implications of this research. Limitations of the study and recommendations for future research are also addressed.

Chapter 2 - Literature Review

In their review on inter-organizational networks Provan et al., (2007) state that extant literature on networks considering all academic journals surpasses 50.000 entries. On an inter-organizational level, networks have been studied from within various academic disciplines, such as organization theory (Paquin and Howard-Grenville, 2013), computer science (Camatinha-Matos and Afsarmanesh, 2005), strategic management (Doz et al., 2000), sociology (Granovetter, 1985), public administration (Provan and Lemaire, 2012), public policy (Eickelpasch and Fritsch, 2005) and economics (Porter 1990). For this reason, there are currently many conflicting, complementing and overlapping concepts. The first section of this chapter deals with establishing important conceptual distinctions between different kinds of networks. This first section distinguishes between the use of a network as an analytical model to study inter-organizational or regional economic and social behavior (Ahrweiler and Keane, 2013; Rycroft and Kash, 2004), or the analysis of a network as a distinct organizational form with its own goal Provan et al., (2007). The latter concept is further explained along with the concepts of a network structure and network governance. Finally, the two different approaches to the establishment of goal-oriented networks are presented together with problems featured in some of the approaches.

The second section of this chapter discusses and defines the concept of innovation networks as important drivers of innovation and economic output. The third section provides an overview of the literature on network management, and finally provides a model for the organization of the different concepts related to network management. Network management is regarded as an indispensable

part of a goal-oriented network.

Finally, aligned with the motivations and research goals driving this work, the fourth section discusses in detail the concept of network commitment, along with its relevance for network sustainment. Avenues of future research are also discussed in this section.

2.1 The Network Concept – An Analytical Model or Organizational Form?

In their seminal work, Provan et al. (2007) focus on the concept of the “whole network” or goal-oriented network as a distinct organizational form with its own form of governance. As the name indicates, a goal-oriented network is comprised of a group of organizations pursuing a common goal.

This concept of goal-oriented networks is well aligned with extant literature (Provan and Kenis, 2008; Saz-Carranza and Ospina, 2010; Provan and Lemaire, 2012), and contrasts with broader definitions of inter-organizational networks. A general concept of an inter-organizational network is employed in research analyzing the relationships, connections and behavior of the individual organizations within a network context (Ex.: Ahrweiler and Keane, 2013; Etzkowitz and Leyersdorf, 2000; Freeman, 1995; Leydesdorf 2003; Lundval et al., 2002). The network concept in this case refers to an analytical perspective – a way in which to model and represent the relationships between the various actors. This is quite different from regarding the network as a distinct organizational form (Provan et al., 2007). Commonly, the more general network concept featured in those studies which look at the interrelations between network actors focus on serendipitous networks (Kilduff and Tsai, 2003). A serendipitous network emerges from inter-organizational connections, and does not have an overarching goal, or a distinct form of governance. This contrasts

with the concept put forward by Möller et al. (2005) of a “networked organization”, which alludes to the concept of a network as a distinct organizational form consistent with the concept of a goal-oriented network (Provan et al., 2007). Unlike a goal-oriented network, a serendipitous network – in its extreme case – may refer to any market (Axelsson and Easton, 1992) or region of interacting organizations and actors (Ahrweiler and Keane, 2013). Aligned within the scope of this thesis, the following section focusses on goal-oriented networks.

2.2 Goal-Oriented Networks

As explained before, a goal-oriented network can be treated as a whole i.e. as an autonomous organizational form with a distinct identity, composed of smaller organizations striving to accomplish a mutually beneficial goal. In the case of goal-oriented networks the number of network partners is finite (Möller et al., 2005), and should be defined, i.e. it is expected that the boundaries of the network are clearly determined terms of network partners (Thorgren et al., 2009); this is the problem of network bounding (Provan et al., 2007).

In such networks, where there is a clear distinction between organizations belonging to the network and those that are not, it is common to have an official network roster where all the network partners are listed. Although, this principle seems straightforward, the issue of network bounding should be thoroughly considered. Provan et al. (2007), for instance, contend that determining who is and who is not part of the network – the problem of network bounding – is a methodological problem that must be fully addressed in order to allow for consistent research. They raise relevant questions regarding the problem of network bounding, such as: 1-What is considered when no official network roster

exists? How shall network membership be determined? 2-What if some participants are on the official roster by name only? Shall they also be considered as part of the network? 3-What if some organizations are strongly embedded with network partners but do not appear on the network roster? In order to address these problems, the present study considers all network partners that are explicitly listed on official network documents as network partners. Furthermore, only listed organizations are considered network partners.

It is clear that some network partners may be in the network “by name only”, and therefore do not participate in the network activities. However, the fact that some network partners are not participating in the network and are listed “by name only” is a problem of network commitment (Adrésen et al., 2012; Human and Provan, 2000). It may additionally be the case that network partners included in the network “by name only” are strategic partners, useful to increase the network’s external legitimacy (Human and Provan, 2000).

This study therefore defines a goal-oriented network as a group of well-defined three or more organizations working in collaboration to accomplish a common goal. This definition of goal-oriented network is consistent with many network designations featured in existing studies on networks such as: goal-oriented networks (Provan and Kenis, 2008; Provan and Lemaire, 2012; Saz-Carranza and Ospina, 2010), strategic SME networks (Thorgren et al., 2009), business nets (Möller et al., 2005; Möller and Rajala, 2007), network initiatives (Huggins 2000), business networks (Ritala et al., 2012), innovation networks (Dhanaraj and Parkhe, 2006; Greenfield et al., 2013), or networks (Lefebvre et al., 2012; Lefebvre et al., 2014; Olsen et al., 2012).

The concept of a goal-oriented network as a distinct organizational form

allows for new areas of research (Provan et al., 2007). By focusing on the network as a distinct unit of analysis (Provan and Kenis, 2008) one can discuss issues such as network governance (Provan and Kenis, 2008), network management (Afsarmanesh and Camarinha-Matos, 2005; Dhanaraj and Parkhe, 2006; Olsen et al., 2012; Paquin and Howard-Grennville, 2013; Sydow, 2010), network creation (Gausdal 2013; Greenfield et al., 2013; Ritala et al., 2012;), network evolution (Brenner and Schlump, 2011; Paquin and Grennville, 2013; Provan et al., 2011; Ritala et al., 2012; Wincent et al., 2013) and finally network performance (Ferreira et al., 2011; Kenis and Provan 2009). It is beyond the scope of this review to focus on each of these areas. The following sections focus on important concepts used to describe and distinguish different goal-oriented networks. These concepts can be applied in any of the above listed areas of goal-oriented network research. Firstly, this section explains the concepts of network structure and network governance as important concepts related to goal-oriented networks. Finally, the differences between top-down and bottom up networks are addressed.

2.2.1 Network Structure

The network structure is dependent on the different network partners and the underlying connections between them. In other words, the structure is dependent on the network's nodes (partners) and linkages (connections).

In terms of network partners, the network structure is determined by how these are positioned towards each other according to their industries' value system (Porter, 1990). The value system is defined by Porter (1990) as a stream of inter-organizational activities that, within an industry, connect the suppliers to the ultimate buyer. Based on the network partners' position within an

industry's value system, Möller et al. (2005) distinguish between vertical and horizontal networks. Vertical networks are networks including partners positioned mainly as a chain of successive potential buyers and suppliers along a value system. Conversely, horizontal networks include network partners which hold identical or similar positions with regard to the value system. Partners in horizontal networks may be direct competitors or may be active in different market segments (Möller et al., 2005). Networks that include both vertically and horizontally aligned network partners' are designated by Möller et al. (2005) as multi-dimensional value nets. The concepts and definitions of horizontal and vertical network structures are consistent with other research (Klerkx and Lewis, 2009; Nassimbeni, 1998; Tomlinso and Fai, 2013; Wincent et al., 2013; Zeng et al., 2010). Analyzing the network structure in terms of partner positioning along the value system allows the identification of situations of potential synergies or competition.

In terms of connections, the density and the nature of the connections is relevant for the network structure. Studies employing methods such as social network analysis (Paquin and Howard-Grennville, 2013; Salavisa et al., 2012; Still et al., 2014) often describe networks in terms of density of connections between network partners. However, the nature of the connections between partners may also vary. An inter-partner connection may be based merely on the acknowledgement of each other's existence or on joint R&D activities or buyer-supplier relationships (Tomlinson and Fai, 2013).

Furthermore, connections between network partners may exist in the context of different degrees of trust or higher levels of economic embeddedness. Embeddedness explains how dyadic and network social relationships constrain

economic action (Granovetter, 1985). Simply put, a network partner, which has positive relationships with another partner will most likely preferentially perform business and cooperate with this particular partner in future. It is therefore evident that the underlying social capital (Burt, 2005) associated with network partner inter-connections is an important factor of the network structure.

In regards to knowledge flow, Ahuja (2000) focuses on the importance of structural holes for innovation. Structural holes are non-existing – or weak connections – between network partners. The bridging of these holes can increase the flow of new knowledge in a network and increase innovation output (Ahuja, 2000). This is closely related to what Granovetter (1985) addresses in his research on the benefits of “weak ties” in a network. While on the one hand the existence of weak ties in a network has been associated with an increase of innovation, on the other, the lower embeddedness of weak ties has been associated with a greater difficulty in promoting cooperation between network partners (Ahuja, 2000; Gausdal 2013; Paquin and Howard-Grennville, 2013).

In summary, network structure depends on the position of the network partners in the industrial value-system, which can result in potential synergies or competition. Regarding the linkages among network partners, not only the connections themselves are important in a network, but also the nature of the inter-partner connections, along with associated levels of embeddedness and social capital (Burt, 2005; Granovetter, 1985).

2.2.1.1 Network Governance

When considering a goal-oriented network, some form of governance mechanisms are required in order to achieve the desired collective outcomes.

Provan and Kenis (2008) introduce three kinds of network governance models suited to inter-organizational networks.

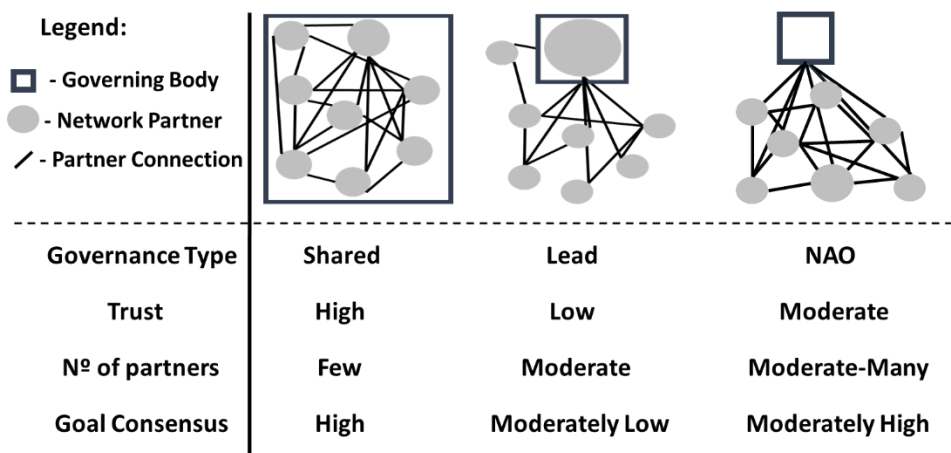


Figure 2.1 - Network Governance Models

The most common form of network governance according to the authors (Provan and Kenis, 2008) is the participant-governed network. In this governance model, there is no separate and distinct governance form. Governance is decentralized and maintained through regular meetings or through uncoordinated activities aiming to contribute towards the network outcomes. According to Provan and Kenis (2008) these kinds of networks are very common in health and human services. Another example would be in the formation of R&D consortia, where power and influence is evenly distributed among the network partners. The downside of such a network governance model is that network partners require high levels of trust with each other and high goal consensus. Accordingly, this form of governance is best avoided in networks with a large number of network partners (Provan and Kenis, 2008). This is in agreement with the research by Capaldo (2014) in which he states that in networks with high social capital and embeddedness Social Mechanisms help govern a network without a hierarchical structure, or the need for an external monitoring agent.

The second form of network governance introduced by Provan and Kenis is the lead organization governance model. Under this governance model a hub firm coordinates and directs the network activities and keeps the network partners aligned. In this case, the hub firm possesses most of the power over the network. Although there may be relationships and exchanges between the other network partners, the network is normally highly brokered by the hub firm. Examples of such networks are mostly found among buyer-suppliers, where the suppliers are from industries with captured value chains (Gereffi et al., 2005), such as with the Keiretsu models in Japanese manufacturing (Gerlach 1992). In horizontal structures, such a governance model may also be possible in cases where the hub firm possesses greater resources, legitimacy or access to strategic markets. The advantage of such a governance model is that, since control is exerted mainly by the hub firm, there is a lower requirement of dyadic trust among the other network partners. Goal consensus among the other network partners is also less relevant, since the hub firm can, in many cases, be solely responsible for determining the role of the network (Provan and Kenis, 2008).

The third type of network governance consists according, to Provan and Kenis (2008), of an independent, neutral organization, external to the network, which has the task of brokering the network, managing conflicts and mitigating damaging actions from network partners such as opportunism. This governance type is defined as a Network Administration Organization (NAO). In such cases, the NAO governs the network activities and must play a key role in network coordination and sustainment. Because of the high-centrality brokerage model in the NAO, this governance mode is best suited to networks with a higher number of network partners, which is moderately high goal consensus and has a

moderate level of inter-partner trust. While the network does require a greater trust and goal consensus as the with the hub firm model, it allows for a greater number of competencies and services to be present in a network (Provan and Kenis, 2008). The downside of such a governance model is that, given the smaller partner involvement, it is harder to keep the network partners committed towards the network activities and goals (Andrésen et al., 2012; Human and Provan, 2000). The NAO governance form is often, implicitly or explicitly, described as the dominant governance form in policy implanted goal-oriented networks (Thorgren et al., 2013), such as those focused on developing collaborative innovation and synergies (Batternick et al., 2010; Gausdal 2013; Greenfield et al., 2013; Paquin and Howard-Grenville, 2013). These introduced models are considered “pure” types of governance, and it is therefore argued that it is possible to find mixtures of the presented three governance types.

2.2.1.2 Bottom-Up vs Top-Down initiated networks

According to extant literature, goal-oriented networks can be initiated from a bottom-up or a top-down approach (Formhold-Eisebith and Eisebith, 2005; Ingstrup, 2013; Wincent et al., 2013). In a bottom-up approach, network partners have the initiative of creating a network, in order to pursue common goals in a more structured way. In this sense, a bottom-up network emerges from previously existing networking activity and social capital, which translates into economic embeddedness and knowledge flows (Ahuja, 2000; Capaldo, 2014; Granovetter, 1975). Such networks are set-up through the initiative of private companies, due to private strategic decisions. At least initially, these networks are privately- administered and are not institutionally funded or monitored. However, bottom-up networks may, at a later stage, be strengthened by

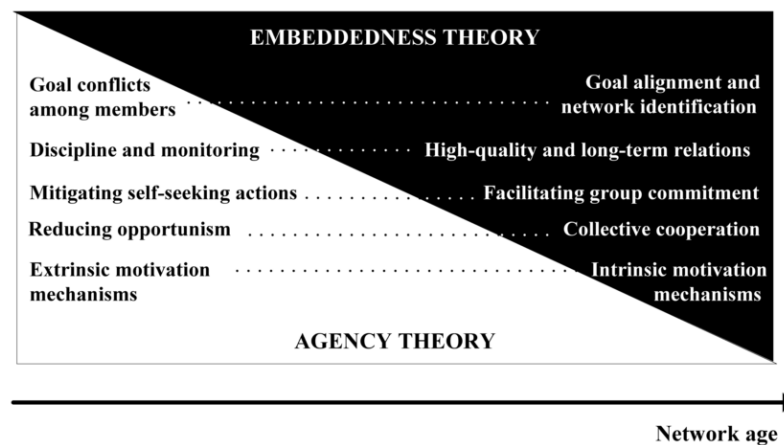
government-sponsored initiatives (Ketels et al., 2006). Examples of such bottom-up, goal-oriented networks are for instance trade associations such as the automotive competence cluster in the Aachen region in Germany (Formhold-Eisebith and Eisebith, 2005) and the Mechatronics Cluster in Denmark (Ingstrup, 2013).

Top-down networks – also referred to at times as policy-networks (Huggins, 2001) – are, on the other hand, initiated and fostered by government incentives, aligned with regional or national policies. In most cases, incentives are created for firms so that they can group together with common goals, such as easier access to R&D funding (Eickelpasch & Fritsch, 2005; Huggins, 2001; Wincent et al., 2013). It is common for network partners to join together which have had no previous connections with each other (Huggins, 2001; Paquin and Howard-Grennville, 2013). Given the absence of social mechanisms governing the network (Capaldo, 2014), it is up to an external entity to assert some levels of external control. In such cases, a NAO (Provan and Kenis, 2008) can be established to mitigate destructive behaviors such as free-riding and opportunism (Batternick et al., 2010; Gulati, 1998; Powell et al., 2005; Wicent et al., 2013).

In Wincet et al.'s (2013) research on the evolution of control in goal-oriented networks, the main governance mechanisms existing in top-town network approaches and in bottom-up network approaches are compared. The authors conclude that governance mechanisms in top-down approaches are better explained through the agency theory (Fama and Jensen, 1983), while bottom-up approaches can be better explained through the embeddedness theory (Capaldo, 2014; Granovetter, 1975). The agency theory states that the

monitoring role of boards in organizations allow for control in mitigating problems such as free-riding and opportunism (Fama and Jensen, 1983). In the context of a goal-oriented network, an independent board – or NAO – has the need to monitor and broker the network partners in order to spread knowledge of each other's resources, align network partner goals, mitigate self-serving actions and provide incentives in order to gain the network partners' motivation and commitment (Wincent et al., 2013). The embeddedness theory, on the other hand, states that embeddedness (Granovetter, 1985) in a network increases knowledge of partners' resources and capabilities and trust, and decreases free-riding (Gulati and Gargiulo, 1999; Powell, 1990). Through embeddedness, network partners' goals are more aligned, and their commitment towards the network is increased. The required levels of control or incentives to be exercised by the NAO are therefore diminished in networks with higher levels of embeddedness.

Higher levels of control enforced by the NAO are expected to be necessary in young, top-down networks where embeddedness and social capital is still in its infancy. However, as the network matures, and the network partners are increasingly embedded, the network is less dependent on the NAO for success, and becomes a more sustained form (Gulati, 1998; Powell et al., 2005; Wincent et al., 2013). The network evolves from “being an object of control, to being a mechanism of control” (Wincent et al., 2013, p. 481). Figure 2.2 sums up the connection between agency theory, embeddedness theory and network maturity.



**Figure 2.2 - Network Controls According to Embeddedness and Agency Theory
(Adapted from Wincent et al., 1013)**

As can be seen in Figure 2.2, it is important for younger networks to mature, in order to benefit from the advantage of embeddedness controls and intrinsic motivation mechanisms. A mature network has clearer exchange routines and reciprocity (Ahuja, 2000), resulting in reduced transaction costs (Uzzi, 1997) and finally better network outcomes (Huggins, 2001; Williams, 2005). Accordingly, Fomhold-Eisebith and Eisebith (2005) state that bottom-up clusters are more effective in achieving stronger relationships between firms and developing collaborative R&D and innovation. In his survey-research on twelve top-down networks with a total of 531 companies, Huggins (2001, p.453) concludes that “where network initiatives are able to draw-in a critical mass of committed firms over a sustainable period, networks can act as an effective and important instrument for economic development.” He also concludes that individual firms which commit themselves to the network membership show the highest economic growth.

Although it has been shown that mature networks are more beneficial than young, top-down networks: research has found that 80%-90% of top-down networks do not evolve into sustained forms (Huggins, 2001). The difficulty of

network partners committing to policy sponsored top-down networks has also been referred to by more recent studies research (Andrésen et al., 2012; Fromhold-Eisebith and Eisebith, 2005; Sölvell et al., 2003). The problem is that in top-down approaches, network partners are incentivized to join the network, but are free to leave whenever possible (Wincent et al., 2013). This can result in partner dropout rates (Barringer and Harrison, 2000; Batternick et al., 2010; Dhanaraj and Parkhe, 2006; Huggins, 2001), which may end in network failure (Human and Provan, 2000). As it is a core theme of the present dissertation, the concept of network commitment is described in closer detail in the final section of this literature review (section 2.4)

The next section focusses on innovation networks as a particular kind of network. The conceptual discussion described in section 2.1. is also applied to innovation networks. Figure 2.3 sums up these conceptual network definitions described throughout this section.

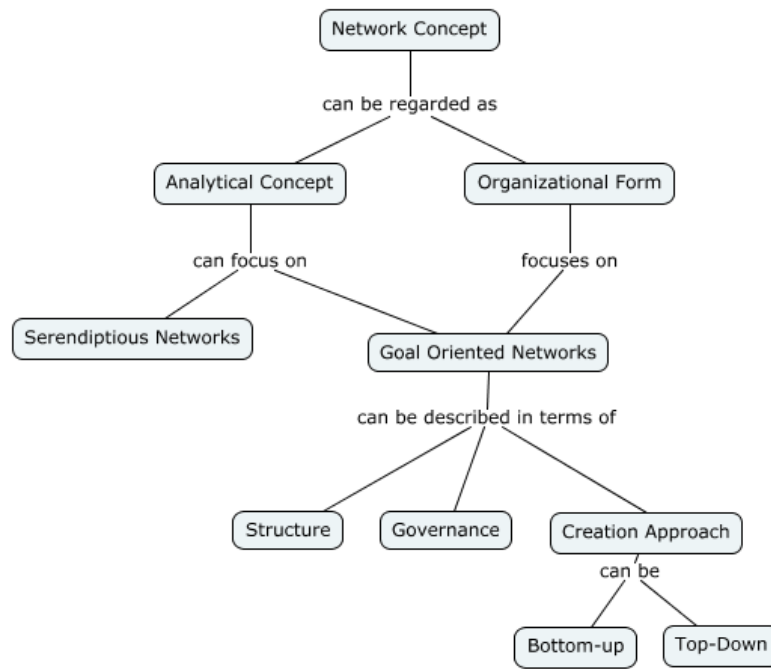


Figure 2.3 - Conceptual Map for Networks

2.3 Innovation Networks

Since the seminal work by Porter (1990) on how clustering and networking effects in regions are positively related to innovative outcomes and subsequently to economic performance, there has been growing interest in this aspect of innovation networks. In fact, research has repeatedly shown that networking between different organizations and companies tends to increase firms' innovation and economic output (Doz et al., 2000; Pittaway et al., 2004). Networks allow for the combination of skills and knowledge, which can result in radical innovations (Ahuja, 2000). The concept of innovation networks has been defined from the perspective of various scientific disciplines, and this has led to different formal definitions. The following section therefore focuses on defining the concept of innovation networks. This is followed by focusing on goal-oriented top-down innovation networks.

2.3.1 Defining Innovation Networks

Innovation networks have been defined by several authors, both explicitly (Ahrweiler & Keane, 2013; Batterink, et al. 2010; Rycroft & Kash, 2004) and implicitly (Dhanarag & Parkhe, 2006; Pyka, 2002; Rampersad et al., 2010). The objective of this section is to present a definition of innovation network by reviewing the existing definitions of the concept. To this effect, Table 2.1 presents several definitions of innovation networks present in the literature.

Table 2.1 - Literature with Explicit Definitions of Innovation Networks | E -> Explicit; I -> Implicit; X -> Not mentioned

Source	Innovation Network Definition	Definition Elements				
		Organizations	Linkages	Knowledge / Skills / Ideas / Resources	Technology	Market
Ahrweiler & Keane 2013	<i>"[Innovation networks are] those networks that involve the interplay of people, ideas and organizations to create new, technologically feasible, commercially-realizable products, processes and organizational structures"</i>	E	E	E	E	E
Arranz & Fdez. de Arroyabe 2012	<i>"Innovation networks are defined as the union of two or more parties, institutions or individuals, for the purpose of developing a technological project"</i>	E	E	I	E	X
Batterink et al. 2010	<i>"Innovation networks can be viewed as cooperative relationships between companies and other actors who seek innovation."</i>	E	E	I	I	I
Eschenbacher & Graser 2011	<i>"By this definition, an innovation network is a set of distributed people and resources that are merged and synchronized in order to create new products, services, or organizational models."</i>	E	E	E	X	E
Gardet & Mothe 2011	<i>"Innovation networks – which consist of sets of vertical and horizontal relations established among various organizations that are orchestrated by a hub firm so it can take advantage of invention(s)"</i>	E	E	X	E	I
Klerkx & Aarts 2013	<i>"A network is defined here as "groups of three or more legally autonomous organizations that work together to achieve not only their own goals but also a collective goal" Provan and Kenis (2008), and in the case of innovation</i>	E	E	X	X	X

	<i>networks these are often 'loosely coupled organizations' that are responsive to each other but also retain separateness and identity (Dhanaraj & Parkhe, 2006)"</i>					
Landsperger & Spieth 2011	<i>"[A] cooperative settings of three or more legally independent organizations that collaborate in one or more steps of the innovation cycle in order to develop and/or market their products or services"</i>	E	E	I	I	E
Landsperger et al. 2012	<i>"[Innovation networks are] networks that aim at fostering joint innovation efforts between distributed partners."</i>	E	E	I	I	I
Ojasalo 2008	<i>"The term "innovation network" refers to a set of actors mobilized by a focal company for R&D activity."</i>	E	E	I	E	X
Rycroft & Kash 2004	<i>"[Innovation networks] are linked organizations (e.g., firms, universities, government agencies) that create, acquire, and integrate the diverse knowledge and skills required to create and bring to the market complex technologies (e.g., aircraft, telecommunications equipment)"</i>	E	E	E	E	E

As can be seen in Table 2.1, the definitions of innovation networks contain, in general, the same elements: organization; linkages; knowledge, skills, ideas and resources; technology; the market. Organizations are the main actors inside an innovation network: this can be characterized as the network nodes. Linkages are the connectors between the different organizations: these linkages can depict social relationships, formal or informal business relationships (Salavisa et al., 2012), or the flow of information or resources between the different network partners. Technology or new technology is a result of the cross-fertilization of ideas and knowledge from different organizations along with the required leverage of shared resources to successfully create the technology. Technology is here defined as the application of tools, materials, processes, and techniques to human activity (Shane, 2009). The market is a final important element of most innovation networks definitions, and reflects the economic motivation for the establishment of such networks (Ojasalo, 2008). Innovation therefore is understood as the creation of new, technologically feasible, commercially viable

products, processes or organizational structures (Ahrweiler & Keane, 2013; Fagerberg, 2003).

After discussing the different definitions, this section concludes by proposing an overall definition of innovation networks based on the definition featured in Rycroft and Kash (2004, p187) as: *“linked organizations (e.g., firms, universities, government agencies) that create, share, acquire and integrate the diverse knowledge, skills and resources required to create new technologies and new products or services and bring them to the market.”*. The difference from this definition and the definition featured in Rycroft and Karsh (2004) is the explicit mentioning that network partners may share resources in addition to knowledge and skills. Secondly, this chapter contends that innovation networks do not necessarily have to focus on complex technologies.

2.3.2 Fostering Goal-Oriented Innovation Networks

Section 2.1 explains how research on inter-organizational networks can generally be distinguished between those using the network concept as an analytical concept or those focusing on networks as an organizational form with a distinct goal (Provan et al., 2007). This distinction also applies to innovation networks. In the case of goal-oriented networks, these may emerge (bottom-up) or may be intentionally fostered (top-down). Due to the positive outcomes of innovation networks, attempts to foster goal-oriented innovation networks have been undertaken recently by firms (Dhanaraj and Parkhe, 2006) or through the intervention of national or regional policy (Gausdal, 2013; Greenfield et al., 2013; Huggins, 2000; Human and Provan, 2000; Paquin and Howard-Grenville, 2013). The main goal of such networks is to share, combine and leverage knowledge and resources to develop new technologies and services and bring

them to the market.

It has been demonstrated that SMEs have the most to gain from high networking activity (Barringer and Harrison, 2000; Baum et al., 2000; Doz et al., 2000). However, because of their smaller size, SMEs have a more limited capability to process and assimilate new information and knowledge (absorptive capacity) (Cohen & Levinthal, 1990) and scarcer resources needed to perform R&D activities (Batterink et al., 2010; Gardet & Mothe, 2011; Landsperger et al., 2012; Olsen et al., 2012). In order to mitigate these problems institutionally sponsored innovation brokers (Kirkels and Duysterns, 2013; Klerkx and Leewis, 2009), also designated innovation intermediaries (Katz et al., 2013; Klerkx and Aarts, 2013; Klerkx and Leewis, 2013) or innovation champions (Klerkx and Aarts, 2013) are tasked with promoting networking and innovation within a certain region, industry. Innovation brokers may be tasked with orchestrating their ego-networks, or tasked with orchestrating a specific top-down or bottom-up goal-oriented innovation network. As explained in section 2.1.1.3, especially in top-down network approaches, it is important to manage the network in order to maintain the sustainability of the network and reap the network benefits over time. The following section focuses on network management, given its importance for goal-oriented innovation networks.

2.4 Network Management and Orchestration

Studies dealing with network management distinguish between the network's context, network creation (or design) and network operation, as depicted in the conceptual model in Figure 2.4. This model is extended later in Chapter Six.

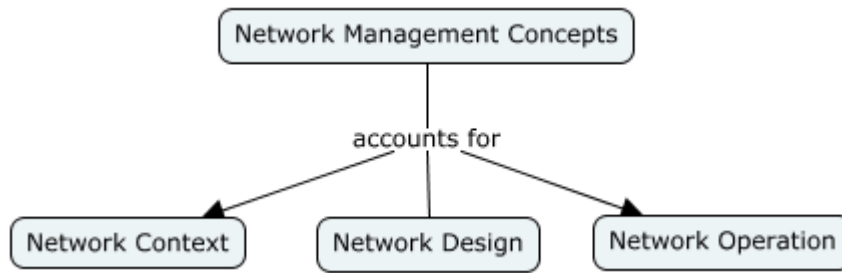


Figure 2.4 - Network Management Concepts

Although not always explicit, literature converges around these three concepts. Harland et al. (2004) describe a model under which to research the creation and management of supply networks. In their conceptual framework, the authors distinguish between the network's context, the network's creation phase, and operation phase. The network context concept accounts for the market environment with its products and services, supply network structure, and finally the supply network's strategy. Network creation focusses on designing an initial network structure in which the network can later be operated. Finally, network operation refers to the activities responsible for transforming inputs into outputs and maintaining the network sustained over time (Harland et al., 2004). Both the network creation and network operation phases are affected by the environmental context in which the network is created (Harland et al., 2004). Carneiro et al. (2012) refer that in the area of network management, the questions of "what?", "how?" and "why?" are normally posed. "What?" referring to the network topology, "why?" to the network underlying goals, and "how?" to the network processes. Under the Harland et al. (2004) model, the "what?" and "why?" questions would be answered in the network design stage. The "how?" question would be answered in the network operation phase. Finally, the inclusion of the "where?" question, would account for the network context. In his

literature review on inter-organizational networks, Ozman (2009) identifies different main research themes in network research. He differentiates between studies focusing on network structure, external conditions, the origin of networks, and firm performance in networks. Literature focusing on the network operation is addressed in the review under the category dealing with origins of networks (ex.: What is the effect of external conditions on inter-firm collaboration? What is the effect of network structure on partner activities?).

As can be seen in Table 2.2 most of the literature related to network management, does not fully address network context, network design and network operation. Normally focusing at times only on two – or even one – of the three concepts.

Table 2.2 - Literature for Network Management

Literature	Context	Design	Operation
Batternick et al., 2010		x	x
Carneiro et al., 20012		x	x
Cravens et al., 1996	x	x	
Dhanaraj and Parkhe, 2006		x	x
Gausdal and Nielsen, 2010		x	x
Gausdal, 2003		x	x
Harland et al., 2004	x	x	x
Koka, 2006	x	x	
Leván et al., 2014		x	x
McGuire, 2002	x		x
Möller et al., 2005		x	x
Nambisan and Sawhney, 2011		x	x
Olsen et al., 2012		x	x
Ozman, 2009	x	x	x
Salavista et al., 2002	x		x
Sydow and Windler, 1994		x	x
Sydow, 2010		x	x
Thorgren et al., 2009		x	x

The connection between network design and the network environment

have been established for instance by Cravens et al. (1996) and Koka (2006). Based on literature discussion and data from focus groups, Cravens et al. (1996) develop a framework for network classification. The authors distinguish between four different network types: Flexible Network, Hollow Network, Virtual Network and Value Added Network. The distinction of each network type is based on the network context (environmental volatility, market structure and technological complexity) and network structure (network partner's core competencies and relationship types). Koka et al. (2006) establish propositions connecting network structure properties such as network size and partner connectedness with the environmental uncertainty and munificence in which the network is inserted.

Literature more closely focused on management of innovation networks, tend to treat the network context as a contingency (McGuire, 2002; Sousa and Voss, 2008), and focus more on the interplay between network design and network operation (Batternick et al., 2010; Dhanaraj and Parkhe, 2006; Gausdal and Nielsen, 2010; Léven et al., 2014; Möller et al., 2005; Nambisan and Sawhney, 2011). In their seminal work introducing the concept of network orchestration, Dhanaraj and Parkhe (2006) propose a framework for the management of innovation networks governed by a hub firm. This framework clearly distinguishes between a network design phase and a network orchestration phase. In the network design phase, network structure along with membership size and hub firm position is taken into account. The orchestration phase distinguishes three processes to ensure network innovation output: managing knowledge mobility; managing innovation appropriability; and managing network stability. Since innovation output is the final dependent

variable in Dhanaraj and Parkhe's (2006), it has been successfully repeatedly employed as a research framework for innovation networks. Some examples are Batternick et al. (2010) and Gausdal and Nilsen (2010). Nambisan and Sawhney (2011) build on the framework by Dhanaraj and Parkhe (2006) distinguishing between network design, innovation design, and the network orchestration processes. In terms of network operation, Dhanaraj and Parkhe (2006) contend that an innovation network manager must manage knowledge mobility, innovation appropriability and manage network stability in order to achieve an innovation output.

A more general framework for network management proposed by Sydow and Windler (1998) and later Sydow (2010) describes four main functions that a network manager must perform for efficient network management: the selection function, the regulation function, the evaluation function and the allocation function. Möller et al. (2005) focusing on the Present Value system as key element for network design and identify different network types, and associated managerial implications. These network types are based on a horizontal or vertical network partner configuration.

Finally, some research does not refer network design and focusses directly on the interplay between network context and network operation. This tends to consider both the network structure and the network context as the environment for the network activities (McGuire, 2002; Salavista et al., 2012). McGuire (2002) for instance discusses how network manager activities can differ with varying environments. He characterizes the environments by focusing on core variables namely: goal consensus; resource distribution; political and social support; previous relationships; policy incentives and network strategic

orientation public networks. Salavisa et al (2012) for example focus on how the context of the industrial sector influences the behaviors of innovation networks in terms of network topologies and network partner activities in accessing information. Such studies do not distinguish between network context and network design, because the network itself is not viewed as a network organization (Thorgren, 2009). It is instead treated as serendipitous network, resulting from the sum of inter-firm connections. In this sense, the network structure does not have any clearly defined boundaries with its environmental context, but is in fact part of the environmental context.

The goal of this review was to provide an overview of the network management frameworks applicable to goal-oriented top-down innovation networks. Chapter Six builds on this review and, with inputs from the case studies, develops a conceptual management framework. From the review above, it is clear that research on network management focus on the network environment, the network design and the network operation (Figure 2.4).

The presented frameworks tend to focus on innovation output (Dhanaraj and Parkhe, 2006) or network efficiency (Sydow and Windeler, 1998). Other research on managing the creation and development of top-down goal-oriented networks have mostly focused on the practices, processes and structures leading towards either successful or unsuccessful outcomes (i.e. Batternick, 2010; Gausdal, 2013; Olsen et al., 2012; Thorgren et al., 2009). However, although some research does refer to the importance in maintaining network stability, there are currently a gap in the literature concerning a management framework focusing on developing top-down networks that are sustained in the long run. This is surprising, since networks achieving sustained collaboration through

committed partners have been shown to achieve improved results (Huggins, 2000; Human and Provan, 2000; Roxenhall, 2011; Williams, 2005), and be more resilient to external environmental changes (Kramer, 2014). The following section focusses on the concept of network commitment in inter-organizational networks.

2.5 Network Commitment

The concept of network commitment has been the main focus of few studies (Andresen et al., 2012; Clarke, 2006; Kramer et al., 2013; Kramer, 2014; Roxenhall, 2011). This concept has been linked to increased network performance (Clarke, 2006) and network resilience (Kramer et al., 2013; Kramer, 2014). However, despite the importance of network commitment described in other research on networks (Provan and Lemaire, 2012), recent research focusing directly on this concept has repeatedly stated that there is insufficient knowledge on this topic (Andresen et al., 2012; Kramer, 2014). This section discusses the concept of network commitment, provides a conceptual definition, and reviews what is known regarding this concept. Finally, this section addresses how the concept of network commitment can be operationalized.

2.5.1 Concept Definition

In organizational theory, organizational commitment in the intra-organizational context has been defined as ‘a psychological state’ that describes an individual’s connection with an organization and governs his decision to continue membership or take part in activities related to this organization (Allen & Meyer, 1991). A committed individual has a strong desire to maintain a link with the organization, while taking on efforts for its success (Mowday et al.,

1987). Allen and Meyer (1991) describe three components of commitment: namely affective, continuance and normative commitment. Each of these components is associated with different antecedents of organizational commitment.

Affective commitment is related to the individual's emotional attachment to the organization. For example, when an employee wants to continue working at an organization because he is emotionally involved and identifies with it. Continuance commitment is related to awareness of switching costs that are associated with a termination of the relationship. In this case, the employee continues working at the organization by need. Finally, normative commitment refers to a feeling of obligation to be attached to the organization. The employee works at the organization because 'he is supposed to' (Allen and Meyer, 1991).

Clarke (2006) contends that network commitment is a psychological state composed of these three mind-sets, driving network partners towards collective outcomes. Aligned with the conceptual discussion by Allen and Meyer (1991), Clarke (2006) and Roxenhall (2011) distinguish between affective, continuance and normative commitment as different components of network commitment.

Conversely, Kramer (2014) develops the concept of network commitment building on the concept of relationship commitment used in inter-organizational studies in marketing literature. The concept of relationship commitment emerged at the inter-organizational level, in the context of dyadic inter-organizational relationships such as alliances and joint-ventures (Owen-Smith and Powell, 2004). Relational commitment is defined by Morgan and Hunt (1994, p23) as a "*partner believing that an ongoing relationship is important as to warrant maximum efforts at maintaining it (...) to ensure that it endures indefinitely*". An organization with high relationship commitment may sacrifice

short-term wins in order to preserve the inter-organizational relationship in the long-term (Morgan and Hunt, 1994). Work on relationship commitment converge around the notion that partners with higher levels of relationship commitment are satisfied with the partnerships and have the sustained desire to keep the inter-organizational relationships active, because of future benefits. Such partners are also more inclined to cooperate and share resources (Dwyer, Schurr, & Oh, 1987; Kramer, 2014; Morgan and Hunt, 1994). Furthermore, research has shown that partners with higher relationship commitment are more inclined to sacrifice private interests in favor of mutual benefits (Dyer et al., 1987; Kramer, 2014).

In the case of a network, analogously to the concept of relationship commitment, it is expected that a network partner with high network commitment will be willing to sacrifice private interests in order to preserve the network and to work collaboratively towards the common network goals. Conversely, network partners with lower network commitment will be much quicker to cancel network membership and participation in network activities when faced with private sacrifice (Andresen et al., 2012; Kramer, 2014). Adapting the definition from relationship commitment by Morgan and Hunt (1994), network commitment is therefore defined as: “a network *partner believing that an ongoing membership in a network is important as to warrant efforts at maintaining it to ensure that it endures indefinitely.*”

The table on the following page sums up the main concepts featured in the discussion.

Table 2.3 - Commitment Concepts

Commitment Context	Designation	Associated Literature
Individual → Organization	Organizational Commitment	Mowday et al., 1987; Allen and Meyer, 1991
Organization → Organization	Relationship Commitment	Dwyer, Schurr, & Oh, 1987; ; Morgan and Hunt, 1994
Organization → Network	Network Commitment	Andresen et al., 2012; Clarke, 2006; Kramer, 2014; Roxenhall, 2011

2.5.2 Literature Focusing on Network Commitment

Only a few published studies have focused explicitly on network commitment. While Clarke (2006) and Kramer et al., (2013) concentrate on public health networks respectively in the UK and in the US. Andrésen et al. (2012) focuses on two regional policy-mandated networks in Sweden. Roxenhall (2011) focuses on a single innovation network, also in Sweden.

Clarke (2006) performed a survey research on 61 public health networks in order to identify antecedent conditions affecting network commitment. Based on a literature discussion, he shows that mutual interdependence, mutual gain, effective conflict resolution, and role clarity positively influence network commitment. A weaker aspect of this research design is that for each network only the network coordinators and chairpersons were surveyed regarding their commitment, which may question whether in fact the commitment of the network partners is in fact being assessed.

Kramer et al., (2013) contend that network commitment is a strong indicator of resilience. Based on this motivation, they research how structural and cognitive embeddedness influence network commitment in the face of changing environments. To conduct this study, they employ questionnaires to perform quasi-experiments with 215 participants from 25 public health networks. In the quasi-experiments, hypothetical changes in the 37 current network context are

described and respondents are asked to predict how this would change their organization's behavior. The study concludes that cognitive embeddedness influences network commitment when there is a change in the network context regarding shared communication and information activities. Although they provide some interesting findings, they conclude that their results do not fully meet conceptual expectations. The fact that the network partners express their views on hypothetical scenarios could also represent a potential weakness in the research design.

Roxenhall (2011) performs a single case study on the relationship between network commitment and structural embeddedness in a network with 55 partners. For this purpose, five actors are interviewed and later their commitment is assessed. The study concludes that the analyzed partners that were better connected in the network, possessed higher levels of affective commitment and lower levels of continuance commitment.

Finally, Andrésen et al. (2012) perform a longitudinal study on two regional policy-implemented networks in Sweden. This study presents interesting findings, which indicate that differences in network goals, network activities and network partners may have an effect on network commitment. Although these exploratory findings are of great interest, the study is mostly descriptive and does not deliver concrete propositions regarding how concepts may be related to each other. The study concludes that further research is needed in order to better understand the contexts and network factors affecting network commitment.

As can be seen from the above discussion, knowledge regarding the factors affecting network commitment is small and fragmented. It is acknowledged by recent studies on the topic that there are currently unknown drivers of network commitment (Andrésen, et al., 2012; Kramer et al., 2013; Kramer 2014). An

explorative, longitudinal, qualitative study on the development of network commitment would complement and extend current theory. Furthermore, the link between network commitment and network sustainment (Provan and Lemaire, 2012; Kramer et al., 2014) would further legitimize the importance of this concept for network management.

2.5.3 Operationalizing Network Commitment

Finally, as one of the main concepts of the present study, it is important to acknowledge the different ways in which the network commitment concept was operationalized in previous studies. Clarke (2006) and Kramer et al., (2013) operationalized the concept of network commitment for use in survey research: Kramer et al. (2013) assess network commitment based on six items on a likert scale as a unidimensional concept. Conversely, consistent with his conceptual definition, Clarke (2006) assesses affective commitment, continuance commitment and normative commitment separately each with two to three items.

In the qualitative study by Roxenhall (2011) network commitment is assessed based on interviews and a questionnaire that is evaluated qualitatively. In the explorative, longitudinal case study by Andresen et al. (2012) network commitment is assessed from a behavioral perspective, i.e. through participant attendance in network meetings and the evaluation of the network partners' behavior towards network activities. Data is obtained via in-depth interviews and filed notes. This final approach is consistent with the definition of network commitment, as: *“a network partner believing that an ongoing membership in a network is important as to warrant efforts at maintaining it to ensure that it endures indefinitely.”*

2.6 Conclusion

The goal of this chapter was firstly to discuss and refine the conceptual definitions related to networks, goal-oriented networks and innovation networks. Secondly, this review focused on important concepts to distinguish between different goal-oriented networks in terms of governance, structure and emergence. Thirdly, as an important concept for goal-oriented networks, literature related to the area of network management was reviewed and a simple conceptual model was developed. The review ends by focusing on the concept of network commitment as an important factor for network sustainment – and ultimately for success. The importance of further research in the area of network commitment has been demonstrated and the following chapter builds on the concepts discussed and refined in this literature in order, on the one hand, to provide the context for the scope of this thesis and, on the other hand, to develop a explorative conceptual framework for the elaboration of the case-studies.

Chapter 3 - Research Methods

This chapter addresses the research methods employed to address the research questions introduced in the Chapter One, namely RQ1: *“What are the drivers for network commitment in top-down innovation networks?”* RQ2: *“How can network commitment drivers be influenced through network management?”* and RQ3: *“How to create and manage top-down innovation networks with committed partners?”*

This chapter starts by firstly addressing the research paradigm, under which the research design is developed. (Burrell and Morgan, 1979, pxii.). Secondly, this chapter discusses the case-study research design based on the recommendations for Yin (2009), Voss et al., (2002) and Eisenhardt (1989). The data-gathering steps performed for conducting the case study are also described, along with the practical analysis methods. Research quality and research ethics are also addressed. Finally, design science research paradigm is introduced. Based on this paradigm, guidelines for the creation and development of top-down innovation networks are designed.

3.1 Research Paradigm

The goal of the present section is to frame the research paradigm guiding this study adequately. For this purpose, this section draws heavily on the scheme for analyzing assumptions about the nature of social science contained in the seminal work by Burrell and Morgan (1979) (Figure 3.1). The classification frameworks in Karlsson (2009) and Meredith et al. (1989) are then employed to further position the research stance.

As can be seen in Figure 3.1, Burrell and Morgan (1979) described different

ontological, epistemological, human nature and methodological standpoints, based on an objectivity-subjectivity continuum.

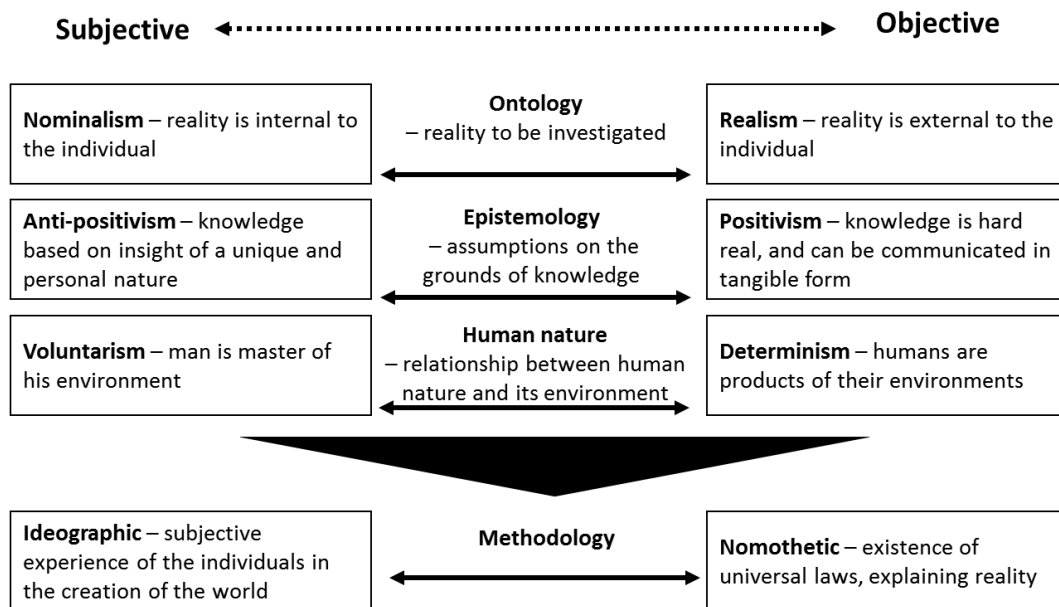


Figure 3.1 - Subjectivity - Objectivity Continuum | According to Burrell and Morgan (1979)

In the case of the present study, from an ontological point of view, when considering an innovation network consisting of differently committed participants and managers, it is not easy to accept that “*the ‘reality’ to be investigated is external to the individual*” (p1, Burrell and Morgan, 1979). This would be the case of a realist ontological approach. Conversely, it is expected that the network is the product of the interaction of various network actors. Using Burrell and Morgan’s phrasing, a network is closer to a “*product of individual conscious*” (Burrell and Morgan, 1979, p1). This ontological view is closer to the nominalist stance.

Epistemologically, given the fact that networks are a result of complex ongoing social processes and mechanisms, it is cautious to take a more subjective stance when regarding the creation of knowledge. For instance, the construct of

commitment can have different meanings, from the perspective of different individuals. Therefore, the creation of knowledge is “*more based on experience and insight of a unique and essentially personal nature*” (Burrell and Morgan, 1979, p2). This philosophical stance is closer to the anti-positivistic stance. This is tightly connected to an existentialist epistemological stance according to Meredith et al.’s (1989), where “*an individual’s unique capabilities, in concert with the environment, are regarded as the basis of knowledge.*” (Meredith et al, 1989, p. 305).

It is accepted that networks are a mixture of engineered and naturally occurring processes (Doz et al., 2000). This statement contains both elements related to voluntarist and deterministic stances on the discussion of human nature. On the one hand, in researching drivers for network commitment, one is looking for ways in which to influence the commitment of an individual (or organization) towards a network of individuals (or organizations). This fact alone allures to the idea that there are certain factors that, when replicated, can trigger the commitment of an individual (or organization) to a network. This view follows a more deterministic stance, in which “*human beings and their experiences are regarded as products of their environment*” (Burrell and Morgan, 1979, p2). On the other hand, however, the view in which “*man is the master of his environment*” (Burrell and Morgan, 1979, p2) also applies; namely when considering that it is possible to control the network by human action. Furthermore, it is important to note that in managing networks, the ‘*free will*’ of the network partners always plays a part, and must be taken into account, in order to avoid a too deterministic view of network management. In conclusion, the view on human nature is aligned with “*the assumptions of many social*

scientists [that] are pitched somewhere in the middle.” (Burrell and Morgan, 1979, p3).

In line with the previously explained philosophical stances, from a methodological point of view, one cannot assume that it is possible to identify “*universal laws, which explain and govern the reality which is being observed*” (Burrell and Morgan, 1979, p3). This is the nomothetic stance adopted by most natural sciences (Burrell and Morgan, 1979). Conversely, it makes more sense to adopt a more ideographic methodological stance that “*stresses the importance of the subjective experience of the individuals in the creation of the social world.*” (Burrell and Morgan, 1979, p3). Finally, it is important to add, that although the ideographic methodological stance has the foreground, the position guiding this work is that even when dealing with a more subjective philosophical stance, it is important and possible to maintain a detailed and protocolled description of the research design, so that it may in fact be replicated in similar environments. The latter characteristic could be associated with a critical theorist stance (Meredith et al., 1989).

In summary, according to the philosophical assumptions discussed above, one can conclude that this research paradigm is well aligned with the constructivist research paradigm as described in Karlsson (2009, p63). The constructivist research paradigm states that observation and analysis is socially constructed, and actions and phenomena are driven by circumstances specific to the observed situation. This kind of research is more concerned with making sense and providing an interpretation of the research phenomenon (Karlsson, 2009, p63). According to the framework put forward by Meredith et al. (1989), the case study research method based on interviews is an appropriate research

method for such a research paradigm.

Having discussed the research philosophy related to this thesis, the following section describes the research design, based on the case study research method.

3.2 Research Design

The case study research method (Yin, 2009) was employed to tackle the research questions: RQ1: *“What are the drivers for network commitment in top-down innovation networks?”* and RQ2: *“How can network commitment drivers be influenced through network management?”*

According to many authors (Eisenhardt 1989; Voss et al., 2002; Yin, 2009), the case study research method is a suited method for exploring new fields and for theory building. Voss et al., (2002) state that a case study for theory building can be particular suited for answering research questions such as *“What are the key variables?”* This “what” question type has an identical format as RQ1. Although Yin (2009) suggests the case study research method be used for mainly “How?” and “Why?” questions, he also states that *“some types of ‘what’ questions are exploratory, such as ‘What can be learned from a study of a startup business?’ This type of question is a justifiable rationale for conducting an exploratory study, the goal being to develop pertinent hypotheses and propositions for further inquiry.”* (Yin, 2009, p.9). In accord with what was explained above, the second research question RQ2 – a why? Question – is also suited to be tackled through a case study research design. It is important to mention that, the particular “How?” question posed in RQ2 is also of an exploratory nature. This is albeit consistent with the main directives expressed by Yin (2009): *“You should also be able to identify some situations in which a*

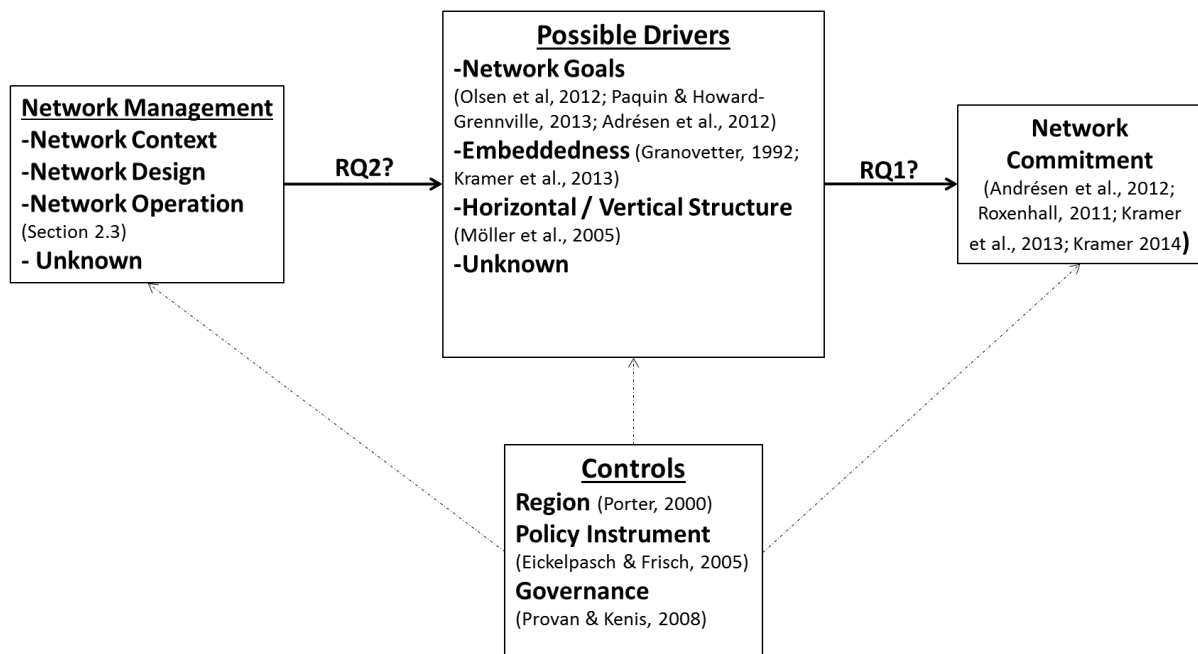
specific method has a distinct advantage. For the case study, this is when: a "how" or "why" question is being asked about o a contemporary set of events, over which the investigator has little or no control." (Yin, 2009, p13). Given the exploratory nature of the research design, no initial propositions or hypothesis were developed. According to Yin (2009), this is appropriate when conducting research that is more exploratory.

3.2.1 Exploratory Conceptual Framework

Yin (2009) contends that as part of designing the case study research, one must prepare by reviewing the literature, discussing the topic with colleagues and know well the purpose of the study and what one is expected to learn. Generally, an adequate theory with existing propositions should be derived as an initial part of the research design; however, Yin (2009) does advocate exceptions for more exploratory research designs. He writes, *"For yet other topics, the existing knowledge base may be poor, and the available literature will provide no conceptual framework or hypotheses of note. (...) Nevertheless, (...) even an exploratory case study should be preceded by statements about what is to be explored, the purpose of the exploration, and the criteria by which the exploration will be judged successful."* (Yin, 2009, p37). Yet, where some previous theories can be identified, Yin (2009) suggests developing descriptive theory. In such case it is important to describe the *"(a) the purpose of the descriptive effort, (b) the full but realistic range of topics that might be considered a "complete" description of what is to be studied, and (c) the likely topic(s) that will be the essence of the description."* (Yin, 2009, p36). In short, the goal of the conceptual framework based on the literature review in such cases is to develop a *'blueprint'* to guide the study (Yin, 2009).

In accord with Yin (2009), from the literature review featured in Chapter Two, the academic gap is identified, along with an in detailed description of what is known regarding the network commitment, and how this may be assessed. While a single framework ‘*of note*’ was not identified, several useful frameworks and potential drivers were identified throughout the literature review. The following explorative conceptual model in Figure 3.2 provides therefore the initial blueprint guiding the study.

Figure 3.2 - Initial Conceptual Guide for Case Studies



3.2.2 Case Study Design

3.2.2.1 Unit of Analysis

The unit of analysis “*is related to the fundamental problem of what the ‘case’ is*” (Yin, 2009, p29). Since the network is being analyzed from the whole network perspective – i.e. “looking at the forest” (Provan et al., 2007) – the primary unit of analysis is at the network level. As there is also interest in characterizing the network from the perspective of the network partners (i.e. in

order to assess their network commitment), a secondary unit of analysis at the network partner level was also employed. This results in a second, embedded unit of analysis.

3.2.2.2 Case Setting

All selected cases were newly created networks from German industry, and sponsored under the same policy incentive system ZIM-NEMO. This allowed for a better control over the environment (Yin, 2009). The ZIM-NEMO policy program funded the network management with up to 90% of the costs in the first year, 70% in the second, and 50% in the third year. After the third year all network costs had to be sustained by the network partners, or would collapse.

3.2.2.3 Longitudinal Embedded Multi-Case Studies

In order to improve generalizations of the findings (Yin, 2009) and the “*risks of misjudging single events and of exaggerating easily available data*” (Voss et al., 2002, p.202), the multi-case study approach was employed. An additional advantage of using the multi-case study is that it allows for the employment of powerful analysis techniques such as pattern matching and cross-case synthesis (Miles and Huberman, 1994; Yin, 2009). Conducting multiple cases should not be regarded as a statistical sampling logic, as in a survey, but according to a replication sampling, or theoretical sampling logic. This allows for the development of analytic generalizations from the data instead of statistical generalizations (Yin, 2009). In order to allow for better understanding for the unraveling processes in the network, the research was performed longitudinally. Performing the case longitudinally has the advantage for allowing the identification of cause and effect among the concepts. In addition, this has the advantage of mitigating to some extent the problem of post-rationalizing that can

emerge in retrospective cases (Voss, 2002). Given the time frame of the data collection and the different times at which the networks were created, these case studies were performed partly retrospectively, and partly in real time (see Figure 3.3).

A recognized main challenge in analyzing different networks in the same study has been the fact that networks can be very distinct in terms of governance, context, activities, or sponsoring policy incentives. The fact that all networks stem from the same policy incentive, and were created more or less at the same time in the same country, allows for a tighter control over the external processes. Chapter Four describes the case setting in greater detail.

Initially, nine network cases were selected for pre-analysis. However, two networks failed within the first year and were thus excluded from the study. The resulting cases used for the purpose of the study are presented in the table below (Table 3.1). Greater detail regarding the cases will be presented in Chapter Four.

	Starting Date	Partners				Outcome
		RTD	SME	Total	SME/RTD	
A Network	01.01.2011	1	11	12	11.0	Sustained
B Network	01.10.2011	9	22	31	2.4	Collapsed
C Network	01.10.2010	6	16	22	2.7	Sustained
D-Network	01.10.2010	1	8	9	8.0	Collapsed
E-Network	01.04.2011	5	11	16	2.2	Sustained
F-Network	01.01.2013	3	9	12	3.0	Sustained Expected
G-Network	01.02.2012	7	17	24	2.4	Collapsed

Table 3.1 - Selected Cases for Case Study Research Design

3.3 Data Gathering

Data gathering was based primarily on semi-structured interviews with network managers, semi-structured interviews with the network partners and fieldwork. Official reports on the networks, internal network and project working

documents such as excel files, power-point presentations used in network meetings, and meeting minutes were also used.

Data was initially gathered during a six-month fieldwork period between November 2012 and May 2013. Participatory data collection was performed as an observer of meetings, where network managers discussed their experiences while developing their networks. Additionally access to project meetings from the networks under analysis was granted. Notes were taken during this time in the field (Eriksson and Kovalainen, 2008).

The main source of data for the seven case studies came from the semi-structured interviews. The first set of semi-structured interviews was set in March 2013. All network managers were interviewed regarding their network goals, and the activities they were performing in the network, and how the network partners' motivation was being affected by this. These interviews averaged about 1.5 to 2 hours in duration. In addition, for each network, four to five partners were interviewed in short, five to ten minute interviews, concerning their experience in the network. The sampling rationale here was to select partners that were research institutes, SMEs, and one partner that did not appear to be very motivated in the network. Expert opinion from each network manager was relied upon to determine the best-suited partners for the interviews. Guidelines for these sets of interviews are available in appendixes I and II.

The second set of semi-structured interviews was held around a year later, during the second quarter of 2014. Guidelines used for these interviews are available in appendixes III and IV. Questions were re-iterated, and some questions that were not bringing relevant insights were dropped. Again, each network manager was interviewed between 1.5 to 2h. Due to the identified

importance of the insights from the network partners, interview questions were extended in this case. Average duration for these sets of interviews was between 20 and 30 minutes. From each network, three to four partners were theoretically sampled for interviewing. In order to account for different partner types, for each network one research institute, one SME and one less motivated partner were interviewed. Interviews with network managers took place in April 2014 and interviews with network partners took place in May-June 2014.

The third set of interviews was in January-February 2015. Managers of the networks that were still being funded under the ZIM-NEMO program in June 2014 were interviewed again to assess if there were any further developments in the network, and if the network was going to be continued after the program finished. These interviews averaged around 20 minutes. Additionally, in order to confirm that the network partner sampling strategy did in fact provide a good overview of the network partners' experiences and motivations, one network was selected to have all the network partners interviewed. As expected, no new themes were identified from interviewing all network partners instead of the 3-4. The final set of interviews was in September 2015 with the network managers from F and G network, given that these were the only ones that had not yet completed the full three year funding cycle (Figure 3.3).

In addition to the data gathering related directly to the network cases, during April-June 2014, fourteen network managers from other networks were interviewed regarding how they could recognize that a network partner was being committed towards their network, and what in their experience made the network partners commit to the network. These interviews served to confirm that the concept of network commitment was being adequately operationalized. Five

from the 14 managers managed networks under the ZIM-NEMO program. The remaining nine, managed networks created under the Portuguese COMPETE cluster program. Finally, also not directly related to data-gathering for the cases, in November 2015, interviews with 14 network experts were conducted to validate the findings, and constructs. Five of the interviewed experts managed networks under the ZIM-NEMO policy in Germany, and the remaining nine experts managed networks under the COMPETE program in Portugal.

In total, for the case study itself 78 interviews were performed totaling just over 32 hours of recordings. The pre-studies, construct operationalization and validation interviews totaled to over 15 hours. Interviews were performed either in person, or via Skype. A small number of interviews were performed via telephone. All, interviews were recorded, with the exception of one interviewee that refused (a network partner interviewed for five minutes). In this case, notes were taken during the interview.

Finally, extensive network documents were collected from each network. These documents, produced by the network manager and partners, were: the initial network proposal, three yearly network-reports sent to the BMWi, (totaling 1254 pages for all reports and all networks), spreadsheet files with network partner competencies and project data, PowerPoint presentations used in the network meetings, attendance check list at the meetings, and - when available - network meeting minutes. In some cases, additional quarterly network reports were available. Although the information in the official reports was considerable, and relevant to cross-check facts, when confronted with the data in the documents the advice by Charmaz (2006) was taken into account. He states that official records may provide useful information, but may have the

limitations that may be embellished and show a distorted reality (Charmaz, 2006, p37). Since the project documents were sent to policy officials at the BMWi, it was assumed that these reports could – in some cases – contain an understandable amount of embellishment regarding the reality of the networks. For this reason, research mostly relied on extracts from the interviews, which had in most cases the tone of an informal “directed conversation” (Lofland, 1995) and thus less likely for a defensive stance – and embellishments - from the part of the interviewer. Official reports served mostly for cross-checking hard facts from the networks. The figure below presents a timeline with the major interventions for collecting data. For all network cases, data was collected longitudinally: retrospectively from network formation until November 2012, and in real time thereafter until September 2015. The figure below (Figure 3.3) presents the timeline for the cases and the data-gathering steps.

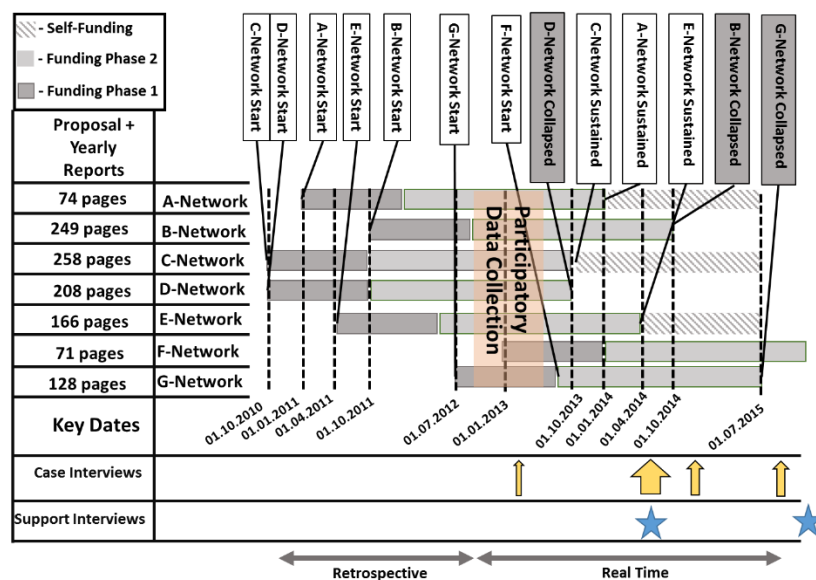


Figure 3.3 - Network Case and Data-Gathering Timeline

3.3.1 Network Commitment Operationalization

As the dependent construct, and the focus of the case study, it was important to have a suitable operationalization for network commitment. It was

thus needed to assess the construct qualitatively among all the network partners and network managers. On the one hand, according to Yin (2009) it is essential to assess construct validity in order to develop good research results. This is vital in the case of the main dependent construct in this study. On the other hand, given that one aim of the study is to identify the drivers, it is important to assess the variation of the construct over time.

Construct validity was achieved by asking the network partners during the interviews how they showed commitment in the network themselves, how they could improve their commitment in the network, and how they could recognize the other networks partners were – or were not – committed. The network managers were also asked how they recognized the network partners were committed, and how network partners could improve commitment. Additionally, as explained in the previous section, 14 network managers active in networks other than the selected for the case studies were asked the same questions. Since responses were in fact consistent, it is concluded that the construct is well defined in the data.

Furthermore, data from the interviews was compared with definitions in the literature. As discussed in the literature review, network commitment is defined as: *“the willingness of a network partner to preserve network membership, participate network activities and work towards common goals, even if (at least in the short run) this goes against the partners’ private interests.”* Since responses from the interviews held consistency with this definition, it is accepted that the qualitative operationalization of network commitment has construct validity.

The problem of assessing network commitment over time was addressed

with two approaches. Firstly, by having a longitudinal approach to the case studies, and by performing interviews at different times over the course of the network duration. Secondly, a more quantitative assessment of network commitment was employed, namely by assessing the variation in partners attending the meetings over time. In fact, previous research has evaluated network commitment based on network partner attendance in network meetings (Andrésen et al., 2012). Furthermore, according to the responses in the interviews, the participation of the network partner in the meeting is a good indicator that they are committed towards the network. This does not only confirm that assessing network commitment via network meeting attendance is valid, but also that there are strong consistencies between the understanding of network commitment in the literature, and from the interviewees. Meeting minutes and signed documents proving the participants presence in the network meetings were used to assess the number of participating firms in the network meetings. These documents were required to exist for all the networks active in the funding phase, in order to comply with the ZIM-NEMO guidelines.

3.4 Data Analysis

This section presents a brief overview of the analysis. Detailed analysis descriptions are presented within each of the main analysis and discussion chapters of the thesis, namely Chapter Five and Chapter Six.

Interviews related to the case studies were adequately transcribed during two months. Initial coding techniques were employed to start working closely with the data (Charmaz, 2006; Miles and Huberman, 1994). Although, Yin (2009) presents solid advice and guidelines for designing the case studies, and for analysis for ‘How?’ and ‘Why?’ questions, the coverage of the initial research

steps required, especially for explorative case studies is relatively brief. For this reason, this work initially draws on the coding and memoing techniques from the area of grounded theory described by Charmaz (2006) and Corbin, and Strauss (2007).

Initially open-coding was employed to start working with the data. “*During initial coding, the goal is to remain open to all possible theoretical directions indicated by your readings of the data.*” (Charmaz, 2006, p46). An advantage of such an initial approach in an exploratory study is that this kind of approach can bring light to new areas and unforeseen research opportunities. This was followed focused coding “*to pinpoint and develop the most salient categories in large batches of data.*” (Charmaz, 2006, p46). In-vivo codes were used sparingly, where the descriptions were very vivid of the problem at hand. Examples of In-Vivo codes identified at this stage and kept on to later stages of the analysis are for instance: ‘*Netzwerk trocknet aus*’ (German meaning: the network dries up) – Used to describe how over time the network may dry up of interesting themes; ‘*frishes Blut*’ (German meaning: fresh blood) – Used to describe how new partners are required in the network to bring new ideas; ‘*Hemmt näher als die Jacke*’ (German expression meaning: the shirt is closer than the jacket – Used to describe how the business goals of the companies are more important than the network goals.

During this stage, initial memoing (Corbin and Strauss, 2007) was performed to promote closer working with the data and promote the flow of ideas, and emerging categories (Corbin and Strauss, 2007). Descriptive summary memos were also developed at this stage for each case study. The initial analysis generated 142 different codes and 492 memos. The entire analysis was

performed with MaxQDA⁴, a qualitative text analysis software. In order to reduce the number of concepts, visual concept mapping was performed using Cmaps (Wheeldon and Faubert, 2009), a knowledge-modelling software, as recommended by Charmaz (2006, p.117). At this stage, the literature was consulted again to assess consistency between the codes and extant research, and theoretical coding was performed (Charmaz, 2006, p.63). During this stage, the main concepts described in detail in Chapter Five and Chapter Six emerged. Code frequency matrixes (Guest and Mclellan, 2003; Arora and Stoner, 2009) assisted with an overview of possible relevant connections between the previously identified codes. Memoing was still strongly employed at this stage to help define and connect the concepts.

The next stage in the analysis was accomplished by using cross-case displays suggested by Miles and Huberman (1994), cross case synthesis, and pattern matching was performed (Yin, 2009). Code frequencies helped maintain an overview of the main themes along all the case studies. At this stage, the evolution of network commitment over time, based on the partner presence at network meetings, was compared against the findings from the cross-case analyses. Axial coding was also employed at this stage. According to Charmaz (2006, p.60), “*Axial coding specifies the properties and dimensions of a category.*” In this sense, axial coding, allowed to understand more clearly the differences between each of the cases, regarding a given concept.

Finally, the propositions presented in Chapters Five and Chapter Six were derived, based on the results of the cross-case synthesis and pattern matching.

⁴ <http://www.maxqda.com/>

These propositions were confronted with the literature. After the successful development of the propositions, these were validated with 14 network experts, as was described in the previous section. The table below presents all the major steps and techniques used for this analysis.

Table 3.2 - Analysis Stages and Employed Techniques

		Analysis Techniques										Develop Propositions	
		Coding					Memoing	Code Matrix	Conceptual Mapping	Literature Consultation	Case-Study Analysis		
		Open	Focussed	InVivo	Theoretical	Axial					Cross-Case Synthesis		Pattern Matchnig
Analysis Stages	Stage 1	X	X	X			X						
	Stage 2				X		X	X	X	X			
	Stage 3				X	X			X	x	X	X	
	Stage 4							X		X	X	X	X

3.5 Research Quality and Ethics

3.5.1 Research Quality Assurance Steps

Yin (2009) describes four tests, which are generally performed to assess the quality of case study research. These tests are construct validity, internal validity, external validity, and reliability. The present section presents the steps that were taken in the design and performance of the study in order to ensure that the research holds up to the described tests.

Construct validity consists in “*identifying correct operational measures for the constructs being measured*” (Yin, 2009, p40). According to Yin (2009), this has been considered especially challenging in case study research. In order to increase the construct validity, previous literature on network commitment was taken into account when operationalizing the construct, as was explained in section 3.3.1. By revisiting the literature regarding definitions, construct validity for the emerged concepts was established.

Internal validity consists in, when establishing causal relationships, distinguish spurious relationships from certain conditions believed to lead to other conditions (Yin, 2009, p40). Although, it is considered that for exploratory studies attention to internal validity is not necessary (Yin, 2009), since this the identification of drivers for network commitment does in fact pertain to some form of causality, steps were taken in order to ensure internal validity. These were namely, the use of the pattern matching (Yin, 2009) technique, and explanation building (Yin, 2009). Explanation building was not only performed during the analysis, but was performed to some extent through the form of questioning used in the interviews. i.e. by querying the network partners regarding their personal drivers of network commitment.

External validity “*defines the domain to which the study can be generalized*” (Yin, 2009, p40). This means in identifying how the findings of the cases are generalizable beyond the cases under analysis (Yin, 2009). This was ensured, through the use of theoretical sampling, in the selection of the cases. Additionally, findings of the cases were compared with extant literature focusing on different networks. Additionally, findings were validated with experts managing networks also under the ZIM-NEMO policy, and experts managing networks under different policy incentives.

Finally, reliability consists in “*demonstrating that the operations of a study-such as the data collection procedures can be repeated, with the same results*” (p.40, Yin, 2009). For this, both strategies recommended by Yin (2009) were followed, namely the usage of interview guidelines for data-gathering, and the usage of a case data-base. The case data-base was divided in three main folders (each of them containing sub-folders, for better organization): 1-Data-

Gathering_Interviews-Containing all transcripts and audio recordings; 2-Data-Gathering_NetworkData-Containing network documents for each of the network cases; 3-Analysis-Containing the analyses performed on the data, including the memos and the MaxQDA files. Further reliability was ensured with this design by minimizing errors and biases. This was possible by triangulating the different interviews from network managers and network partners. Cross-checking hard facts with network documents and official network reports, also ensured minimization of the errors.

3.5.2 Ethics

In order to ensure this work was performed ethically, all interviewees were adequately informed via e-mail or in person of the goals of the study, towards they were contributing. Consent was requested from the interviewees before any recording took place. Only one interviewee refused to be recorder. Finally, confidentiality was assured to all interviewees, be they firms, research institutes or networks. Therefore, all network names, organization names and project names referred to in this study are masked. Raw data was stored electronically, and will be destroyed after final publication of the research.

3.6 Building a Prescriptive Framework

The research questions RQ1 and RQ2 are adequately addressed by the embedded multi-case study presented in the previous sections. Conversely, RQ3 – *“How to create and manage top-down innovation networks with committed partners”* is of a less exploratory nature, and warrants the delivery of a practically applicable framework for the creation and development of top-down innovation networks. RQ3 was therefore performed under the design science research paradigm. As stated by van Aken (2005, p20) *“The mission of a design science is*

to develop knowledge that the professionals of the discipline in question can use to design solutions for their field problems.” Under the design science paradigm a structured approach for the creation of practically applicable interventions was followed. The following section discusses the applicability of the design science paradigm in order to create a practical framework from the findings identified in the case-study research design.

3.6.1 The Design Science Paradigm

The design science paradigm applied to the field of management has been compared to the fields of engineering or medicine in which knowledge is generated with the goal of providing a solution to a problem within a certain context (Hevner 2007; Hevner et al., 2005; Hevner and Chatterjee, 2010; van Aken, 2004; van Aken 2005). Explanatory sciences have the goal to explain and predict (van Aken, 2004). Such is the case of the case-study research design presented in the previous section. Conversely, under the design science approach knowledge creation is more consistent with the so-called mode 2 creation of knowledge (Gibbons et al., 1994; Tranfield and Starkey, 1998). The aim here is to bridge the gap between purely academic mode 1 knowledge and practice, thereby increasing knowledge relevance. As described by Argyris (1993) ‘knowledge for action’ - i.e. to establish relevance for practice.

In his work on management research under the design science paradigm, Van Aken (2005) distinguishes between three distinct ways in which relevance for practice can be improved: The first way is through adequate dissemination of academic research results, so that practitioners have access to new knowledge and can successfully apply them in practice (Hambrick, 1994). A second way to bridge the relevance gap between practice and academic knowledge is by making

sure that the research process itself ensures a tight cooperation between academic inquiry and practice. I.e. the research is aimed at tackling a practically relevant problem, and generating knowledge that both has academic and practical relevance.

The third method described by van Aken (2005) for closing the gap between practice and academic research, lies in following three main principles of the design science paradigm (Hevner 2007; Hevner et al., 2005; Hevner and Chatterjee, 2010; van Aken, 2004; van Aken 2005): 1 – Relevance, i.e. the problem to be solved must stem from a practical need; 2 – Academic rigor, meaning that the developed propositions, and validation methods must stem from scientific knowledge and be grounded on sound generative mechanisms; and finally 3 – Evaluation, i.e. the design propositions must be empirically validated and iteratively refined, if necessary.

The goal of the design science approach is to develop prescriptive propositions solving concrete problems occurring in a pre-defined context. In order to emphasize the fact that these propositions are in fact prescriptive in nature – and therefore ‘artificial’ - van Aken (2004, 2005) goes as far as to describe these kind of propositions as ‘technological rules’. Denyer et al., (2008), using the term ‘design proposition’ instead of ‘technological rules’ recommend a particular fashion in which to express these prescriptions, namely by a CIMO-logic: CIMO stands for Context, Intervention, Mechanisms and Outcomes. The advantage of expressing the design propositions in such a fashion is the fact that all essential components are explicit in the propositions themselves. These components are the practical outcome that is desired, the description of the intervention itself, the context in which the management intervention will be implemented and,

finally, the generative mechanisms which are the underlying drivers explaining why in fact an intervention delivers the desired outcome (van Aken, 2005). Propositions in CIMO-logic have been shown to be successful in explicitly describing how a body of knowledge can be applied to a concrete problem (Denyar et al., 2008).

In addition to the development of the design propositions from existing knowledge, design science based research requires that a practical problem to be solved, and that the design propositions be adequately validated. Only this results in to what van Aken (2005) refers to as ‘empirically grounded technological rules’. To ensure this, three activity cycles consistent with the design science principles are suggested in design science research (Hevner, 2007; Hevner et al., 2004; Hevner and Chatterjee, 2010), namely the relevance cycle, the rigor cycle and the design cycle. The relevance cycle ensures that the connection between the contextual factors or environment and the research process is established. More specifically, the relevance cycle helps determine the practical problem to be solved –i.e. the problem space (Simon, 1996) along with the applicable success metrics. The relevance for practice is also guaranteed through this cycle. The rigor cycle establishes the connection between the research process and the scientific knowledge base. Academic rigor is established by applying the appropriate theories and practices to the creation of the design propositions. Furthermore, the appropriate validation methods are also to be determined in tandem with the used theories in practice. Finally, the design cycle consists of the repeated iteration between designing the ‘technological rules’ or design propositions and evaluating their suitability, based on the pre-determined evaluation methodology and outcome metrics. The iteration between design and evaluation in the design cycle delivers the final design propositions (Hevner et

al., 2005; Hevner 2007). The figure below based on the model by Hevner and Chatterjee (2010) depicts the main cycles within the design science paradigm.

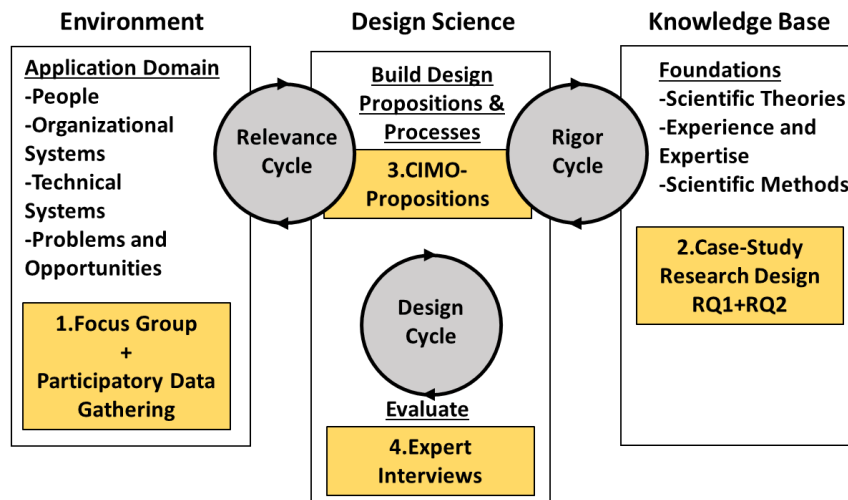


Figure 3.4 - Design Science Paradigm – Includes components from research in yellow, based on model in Hevner and Chatterjee (2010)

Several components allowed completing the design science paradigm cycles. These components (1-4) are depicted in light brown in Figure 3.4. Relevance was achieved by (1) conducting a focus group (Krueger and Casey, 2009) on 09.10.2013 in Germany with a group of ten network managers who are responsible for networks created under the ZIM-NEMO policy program. Along with participatory data-gathering the focus group confirmed that designing networks with committed partners was a practical problem that needed solving. The focus group is described in detail in Chapter Seven. Rigor was established by developing the knowledge base from a solid research design (2), based on time-tested research methods (Yin, 2009). Findings from the case-study research serve as input for the development of (3) design propositions in the CIMO-format (Section 7.2). Finally, the design propositions were evaluated and adjusted with (4) expert interviews held with six network managers from ZIM-NEMO networks and with six managers responsible for networks with a different incentive system (i.e. clusters created under the COMPETE program in Portugal; Section 7.3).

Chapter 4 - The Cases

This chapter presents the data from the case studies used for this research. First, an introduction of the network incentive and political context is made. This is followed by a detailed description of each individual case study.

4.1 Network Context

All analyzed cases were created under the stewardship of the ZIM-NEMO program, sponsored by the German Federal Ministry Economics and Technology (BMWi). In 2002 the German Ministry for Economics and Technology developed the policy program NEMO (Network management East) in order to strengthen innovation networks in eastern Germany, and especially strengthen the market position of SMEs in this area. The main goal of this policy was to fortify the technological basis of companies and research institutes in the region. The NEMO policy incentive assisted in the funding of network management services (Ex.: coaching, coordination and infrastructure services) in order to develop a network of companies and research institutes looking to create new innovations and bring them to the market. A network was defined under this program as a “contractually defined group of companies and research institutes that work together in order to improve themselves technologically and in the marketplace” (Moller, 2012). A network requirement was that at least six SMEs be participating organizations.

The network-funding program consisted in two phases. Phase one lasted one year and phase two lasted for two years. In phase one, the network would be funded with 90% of the management expenses. In case the network was positively evaluated at the end of the first phase, two further funding years would

be approved. In the second network year, 70% of network management costs would be funded by the incentive program, and in the third year, the management costs would be funded by 50% of the network costs. The remaining costs had to be supported by the network partners. At least one general network meeting a year had to be conducted for all network partners. It was up to the network manager to decide upon the creation of more specific project-meetings. Additionally to the network funding, SME-members under the network would have a higher chance of being granted structural funds allocated to collaborative R&D projects.

After 2008, the program was extended to networks from all German federal states. From 2002 until 2011, a total of 200 NEMO networks were approved for funding and 164 networks were approved for phase one. For the networks created after 2008, after both funding phases, 75% of the networks left behind some form of collaboration between some of the network partners. Around 15% of the networks evolved into an officially sustained form.

From a research perspective, analyzing networks fostered under this scope allowed for a very good opportunity for an embedded case study. This allowed analyzing in detail, and compare networks all networks fostered under this program possessed the same funding incentive. Apart from this, network management had a large degree of flexibility in determining the network goal, the structure of the network, the industry where the network was active, and the activities on which the network focused. This proved an interesting opportunity for diminishing contingency factors related to network policy, while at the same time permitting for an interesting variation in the network cases. We the following sections present a description of the development of each of the seven

network cases.

4.2 Case A

A-Network was created to tackle a very concrete problem and market opportunity. The opportunity emerged as a result of the identified need of updating IT-infrastructure in Germany through the installation of fiber-optic cables. Traditionally, service providers would take on this role. However, under current policy, this would be very costly. The goal of the network was therefore to jointly develop and market the installation of fiber optic cables, thereby distributing the risk among the network partners. Additionally, through technological innovation the implementation cost of these projects were expected to decrease by 30%. Based on his own connections, the network manager gathered together network partners with different competencies along the value system required, in order to develop these projects. Great focus was given to ensure each required competency was covered by a network partner. The network was composed by nine SMEs, and one research center.

A-network was officially launched in 2011 with 10 partners. During the first months, it became clear that input from internet service providers as end-users would be vital for the network to create the desired projects successfully. This would allow bringing the network closer to the desired market. As end-users, these new network partners would provide user inputs and assist with commercialization of the network results. The network grew from the initial 10 network members to a total of 12.

“We first focused on the base of the infrastructure, but we also took some service providers in [as partners] so we could have the

external marketing aspect [in the network], to show us how to do things.” – Interview with A-Network manager

The manager put much emphasis on consistently holding network meetings (Figure 4.1) in order to determine in which direction the network and the partners would go as a team. Networking sessions were also held in order to develop ideas for R&D projects and potential sales projects. According to the network manager, although R&D and sales projects should complement each other, it became challenging to balance the needs of the partners that wanted to focus on R&D and the partners that wanted to focus on sales projects.

“I don’t differentiate, because I think [R&D and sales activities] require each other. But some partner differentiate. In principal we just want to develop technologies so we can sell them together. But we have companies that just want a new technology so they can make a new business. And there are never 100% conflict free. (..) [A problem is also] when wit R&D results will only be available in around two years, and that can be a problem in the beginning because we have some partners that already want to take-off and have concrete sales projects.” – A-Network Manager

Activities were mostly geared towards identifying and addressing possible customers and developing sales projects. In this network sales and business development had a greater emphasis than R&D projects.

The network developed very positively during the first and second phases of the official funding period. As reported by both the network partners and manager, network partner commitment was very high throughout the duration of the network (Figure 4.1). General consensus was that the network worked well,

and delivered the desired results to the network partners.

“We were expecting input for the development of our products. And naturally we were also looking for customer contacts for joint selling [with the network partners]. (...) Everyone committed themselves with the best intentions and clear conscience towards the network goals.—Network partner Broadband

After the end of the second funding phase, three years after the network was officially created, most of the network partners actually continued the network in the form of a co-founded joint sales company.

„ We thought, how can we bring something to the market, where not just one, but everyone will profit from...The easiest way was to create a company, where the founders are the network partners. “ – Network partner Broadband

Part of the reason why the partners were so committed to the network was because of the concrete common goals they shared, but additionally because trust among the network partners was very high. As a partner put it, they all “fitted” very well together. In fact, the manager expresses the importance of this aspect very well:

“We looked, where we had firms that fit together, where there was already a good feeling that they trust each other, and we built the project around these companies. Part of the companies already knew each other, and with the others, I was quite sure the chemistry would match.” – Interview with network manager.

A single critical issue mentioned in this network was the fact that during

the first network phase, there were two network partners that had to be substituted. The reason for this was that they were not participating in the network as expected. These partners were substituted shortly before the first year finished. This suggested real cohesion among the other partners.

„There were two companies that in the first year did not want to work as much, they just wanted to take value from the network. (...) and today I would have been quicker in removing them. (...) A network is like a family, there are always those that bother, that is normal. “ – A-Network manager.

The figure below shows consistency with interview accounts. It shows how participation in the network meetings was very high for both network phases. Network commitment was very high in both network phases.

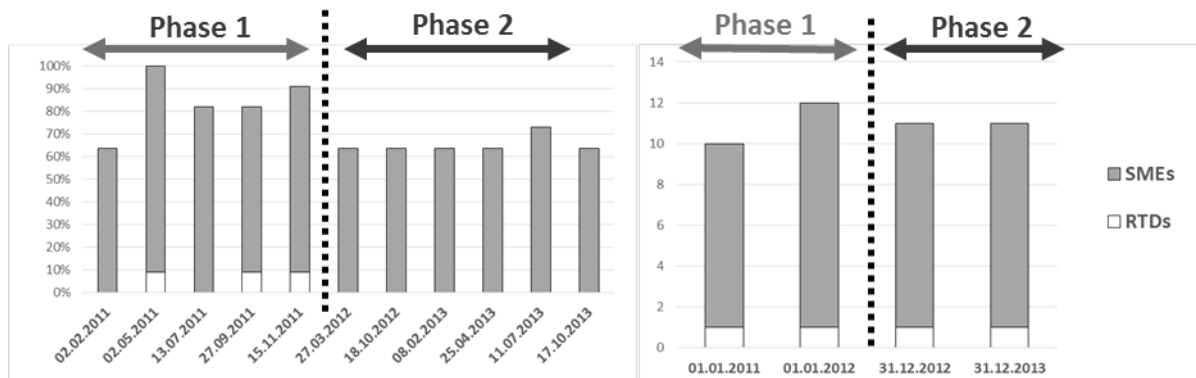


Figure 4.1 - A-Network Chart | Left – Meeting participants (in % of total network members) | Right - Total number of network members | Note: Phase 3 of the network is not represented, because the network evolved into a joint sales company.

4.3 Case B

In 2011, the German Federal Government stated that it planned to close its nuclear power plants by 2022. Under these guidelines, many political incentives towards research and development in the area of renewable energy solutions were being made available by the government. Following the conclusions of a

study by the Intergovernmental Panel on Climate Change (IPCC) stating that approximately 233 million tons of plant organic waste are produced per year in EU-28, the concept for the B-network was drafted. The favorable political framework was the main motivation for the creation of B-Network with the goal of focusing on market-oriented research and technology transfer between industry and academia. The network would concentrate on technologies for the sustainable and efficient use of biological resource waste, with a special focus on renewable energy applications.

The network began officially in 2011, with 15 network partners, of which six were research institutes. The main initial concern of the network manager was to attract as many potential network partners as possible. Network scope was thus framed as broadly as possible and emphasis was placed on publicizing the network in conferences, news articles and social media.

“If I were too specific with the network scope...How many [network partners] would have come? I kept the network theme very broad, in order to attract as many partners as possible (...). I went to conferences that had something to do with biomass, in order to identify these partners (...). I took advantage of personal contacts, and indirect contacts (...). I also did a lot of initial PR work, by writing news articles in order to inform people that this network exists and of what it does. Some people called me up because of this. I also looked for companies that could be interested in internet portals (...) even through google, and phoned them up. (...) I also used Facebook, and social media in order to contact people. I spoke to so many potential partners, around 250 in total“- B-Network Manager

The first network meeting was in the form of a public kick-off event. From the 250 initially invited potential partners, 60 attended this event and eventually 24 partners were officially part of the network. Eight of these partners were research institutes.

During the initial phases on the B-Network, the manager continued to push the external image of the network, by writing press releases and creating high-profile conferences open to the public. It was common to find external participants at network meetings. Network partners greatly appreciated the high-profile events due to the press exposure, networking opportunities and presentations on the industries state-of-the-art.

In parallel, the manager placed much importance on personal conversations with the network partners in order to develop rapport and trust. These personal conversations were also used in order to understand what the main motivations from each individual network partners were, along with concrete ideas for R&D projects that may have existed. Emphasis was given on “getting to know them personally”, and establishing a “friendly relationship”.

“I tried to get to know the people personally, just talk to them and see if they had project ideas that would fit under the network scope. (...) Some people came directly to me with idea suggestions. (...) I always look for the needs of the customer [Network Partner]...does he have any ideas, does he have any partners with whom he wishes to cooperate? If he doesn't, then I will find him a partner (...) A problem is to convince the people that they will profit from the network, so that they sign [the network contract]. (...). But the network is a social relationship...even if the network partner is not convinced from the

network idea, he can sometimes still participate in the network. For example he might say: 'Look Dr. [B-Manager], I do not completely understand the network concept yet, but I trust you so let's do this' – B-Network manager

Given the large number of network partners, an important activity in this network was matchmaking events in order for the network partners to get to know one another. During the network meetings, partners would introduce themselves along with their organizations goals and core competencies.

"Yes, in order to find partners, to identify them...here was at the beginning practically a partner-finding phase. It was first very important that we introduced ourselves, so that we knew the activities and the motivations of each partner. And then also the competencies that they had, so that we could then eventually identify common projects" – Partner B-Network

Although these activities were considered interesting for initial joint project development, some network partners indicated pitfalls associated with putting too much emphasis on the internal networking - i.e. repeatedly introducing themselves to each other. If concrete developments did not arise from the network, partner especially from the industry could, loose interest and leave the network. In order to focus the network partners, workgroups were developed around more specific themes, where several partners showed interest in working.

"Deadly for a network is when you get the feeling that is moving forward. The same is always happening again...It's a killer criterion...you always start from the beginning and introduce each other...if this happens three to five times, then the network will be

dead in just a few meetings. You must feel that you are having progress...first collaborative projects are on the way...first industrial projects...partners need to have found each other...and the workgroups must be there. Very concrete! ...it must be active” – B-network Partner

“If these activities are not quickly transformed in concrete projects, then...it’s how things are...the industrial partners, they must make money...and if after 6-9 months there is no concrete project, (...) And people don’t see, “Aha, if you stay then you get a project, and our interests are fulfilled”, then the interest in the network starts to diminish from the industry side“– B-Network Partner

In the second network-funding phase, the network manager continued work in opening up the exposure of the network to the public, by writing press articles, and participating in international projects on a European level. However, emphasis in the activities shifted more towards creating projects, brainstorming and internal networking.

The network partners praised the work performed by the network manager, and their personal relationship with him. Expressions such as “he is a Super-Manager” and “he is a top manager, he did a really professional job at managing the network” were very common descriptions of his work. Despite this, according to some network partners, it took too long for concrete projects to emerge from the network. Additionally, the availability of interesting themes “started to dry out”. While their relationship with the network manager was superb, they felt little responsibility to ensure survival of the network. The commitment of the network partners started to slowly decrease in the final year of the network. At

the end of the final funded year, there was not enough interest in sustaining the network.

„[The network] slowly dries out of interesting themes, and then comes the danger that the activities become less and less (...) The interest and commitment from the firms started to slowly diminish, it's the nature of things...in the last meetings there were more members from academia than from the industry” – B-Network Partner

“The needs of the industry could have been better focussed. (..) If the industry had been more precise regarding its needs, then it would have been clearer how to create the project”– B-Network Partner

Another main challenge in this network was that due to the broad structure of the network it was harder to bring the partners under one common goal. Additionally, because of some potential competitors in the network, trust levels were not especially high.

“A main problem was to bring the partners on a same point, because in the case of a broad network, then you will also have many different themes. (...) It is very important that partners can work on common activities. In this case to find projects together” – B-Network Partner

„In this network... when someone tells something about himself...this does in fact help build some trust...but it is exactly the same as if he was not from the network... (..) So in this network I would not expect higher levels of trust”- B-Network Partner

“If firms do something similar to what I do, then my trust will not be as high. (...) This existed in the network, to begin with” – B-Network Partner

Finally, some partners seemed not to see themselves as an active part of the network. They saw this network more as a service they were purchasing in order to get access to projects, or stay up to date with current technologies.

„The future of the network, I have no idea...it depends on how the network manager decides to offer...that’s the way of life...No honey...no money” – B-Network Partner

The figure below (Figure 4.2) shows that network participation is consistent with the accounts regarding the level of partner’s network commitment. While in the first network phase and the beginning of the second network phase commitment is considered high. In the final network stages commitment decreases rapidly.

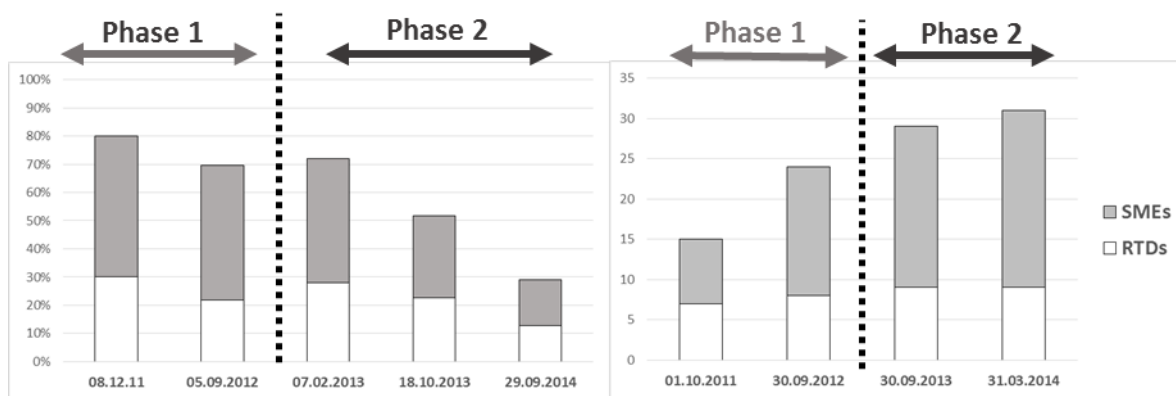


Figure 4.2 – B-Network Chart | Left – B-Network meeting participants (in % of total network members) | Right - Total number of network members

4.4 Case C

In 2010, the German Federal Government announced that incentives were to be created to allow for at least one million electric cars in circulation in Germany

by year 2020. Additionally, financial incentives for research and development in the area of electric vehicles was planned to increase. Finally, there was growing interest from the automotive industry, especially from small suppliers to get a head start in the electric vehicle market.

C-network started officially in 2010 with 10 SMEs and one research institute. The network manager led C-network with the goal of developing new products to address anticipated problems and opportunities in the electric vehicle industry. Based on personal connections from a 20-year career in the automotive industry, from early on, the manager engaged closely with potential network partners, especially SMEs traditionally supplying the automotive industry. He also contacted some firms and research institutes specialized in the areas of power-electronics and electric motors, always stressing the industrial focus of the network. Network partners in this network possessed competencies in the driving system, power electronics, energy management, vehicle body, vehicle assembly and applications. The C-Network manager brought together many of the necessary partners for a large collaborative R&D project, where most of the network partners could participate in. This project (described here anonymously as EAX project) possessed 12 network partners that were to work together on the development of the project for a period of three years. The EAX project raised public awareness for the network, and soon the network grew to 30 partners active in smaller projects in the network.

“I started building the network with my personal contacts that I gathered as CEO of a SME in this business. (...) So it was not difficult to gather interested partners that could be convinced in participating in the network. Also some good contacts to [research institutes] were helpful here. It went quite well, and we were able to get a large project

approved. (...) We grew to around 30 partners (...). We don't just focus on the central part of electro mobility, but also on border-themes. We take into account also what the partner's main interests lie. We discuss these in meetings around three to four times per year.” – C-Network manager

An additional factor that generated much interest in the network was the fact that there was already a large truck manufacturer interested in purchasing the end-result of the EAX project.

“[The truck manufacturer] provides us with tips. They say, ‘if you manufacture it like this and that, then we will buy it. We could use that.’ This gives us positive motivation for the project, knowing that we will eventually have a market for this. “– C-Network Manager

The main activities of this network focused all around concrete projects. The idea behind this was that through close collaboration, the network partners would network, build trust and become motivated participants in the network.

“The first approach was to gain trust [from the network partners], to gain their interest, so they would engage in the network, and get involved in the network themes. (...) You may initially attract a firm into the network out of curiosity (...) but in order to really keep the partners in the network, you have to give them a concrete project. That is the main goal. (...) Some people find it interesting to come to the meetings and listen to what has been achieved. Social and human factors are also part of it. Currently [the network] is a social group that is happy to

meet on the night before the network meeting in the hotel. They are happy to see their comrades again.” – Network Manager E-mobility

Network partners were highly committed towards the network in the first two years of the network. Later, commitment diminished slightly mainly because of changes to the environment where the network was inserted. On the one hand the truck manufacturer interested in the EAX problem pulled back due to changes in administration and long term strategy. More generally, the electric mobility market did not develop as initially expected. Finally, Governmental policy shifted away from promoting R&D in the area of electric vehicles. On the positive side however, the network continued to gain much notoriety among top automotive manufacturers, such as Daimler and VW, due to the large EAX project. The reduction in partner commitment in the final year was also attributed by some members to the fact that the themes in the network had been exhausted. Others argued that the theme of electric vehicles had not developed as quickly as was expected, providing the network partners with a relatively weaker future vision.

“I think the vision of the network could be made stronger, (...) or the themes could be changed, new themes new people and new projects. Some of the network meetings lately have been a bit tiresome, (...) there are almost only EAX people there” – C-Network partner

“(...) we had the feeling that some partners, especially the firms, just wanted to stay in the network as long as they had a direct advantage, and if this cannot be seen, then they will exit from the network. (...) we are shrinking, and if this continues, in the end we will

have just the EAX project, and it is a shame, because we could do a lot out of this.” – C-Network partner

Of the partners that abandoned the network, two unexpected cases were partners that left in spite of still being part of EAX project. The Network Manager was very critical of such behavior.

Official version was they had no human resources, but the unofficial version was that they just wanted to save costs. There are partners, they have a philosophy...they say to themselves: ‘we were there, we profited from the network, we got new contacts, and we were involved in projects, so we will continue to stay here. This philosophy is more long-term. The ones that left the network despite being in the project, they were division managers from a large enterprise. They have pressure to lower costs, and no own philosophy. In a firm with around 200 workers I work directly with the CEO, and their responsibilities. If I talk to a larger firm, however the manager wants to look good in his quarterly reports. Then it is nothing to do with philosophy. This means long term relationships is better with SMEs where you develop contact in the long-term. I told these partners [in the last meeting]: ‘You are free-loaders. You profit from the network, but you are not honorable!’ Some thought it was mean of me, but my opinion is I was entitled to express this” – C-Network manager

In spite of these setbacks, the network commitment was strong enough so that after the funding phase, a core group still active in the project, along with some other partners, decided to continue the network. The partners supported the NAO costs themselves without support from

public funding. Partners integrating the sustained network phase were nine SMEs and four research institutes.

Data in the figure (Figure 4.3) below is consistent with accounts from gathered qualitative data. While there is some decrease in presence at the network meetings, this number remains at moderately high and constant levels in the final network phases.

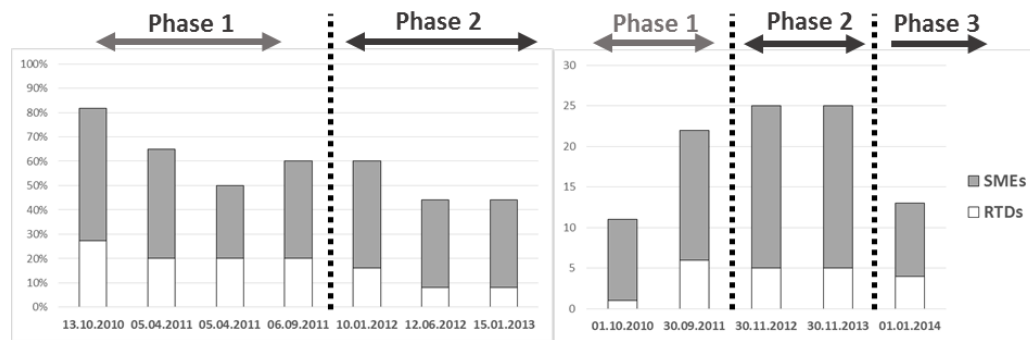


Figure 4.3- C-Network Chart | Left – C-Network meeting participants (in % of total network members) | Right - Total number of network members

4.5 Case D

The initial motivation for this network emerged from a concrete opportunity. The network manager's previous occupation as a business developer for a company selling Ultra Violet Light Emitting Diodes (UV-LEDs) allowed him to identify a new application for industrial UV-LEDs. The new application was to use industrial UV-LEDs to cure UV-paint. The advantage of using this technology, when compared to traditional UV sources, is that LEDs are more efficient and do not emit heat onto the painted surface. This was potentially a large advantage for the painting of thermally sensitive products. When developing the project concept, the network manager discovered that input from various partners would be required for the network. Such partners were UV-LED manufacturers, UV-paint manufacturers, pigment and photo-initiator suppliers, and end-users potentially interested in employing the new UV-painting process. Additionally, a research laboratory was required to help align the paint

specifications with the LED wavelengths. Because of the diverse competencies required for this project, a network was proposed first to deal with this project, and as a later goal identify other applications of industrial LEDs.

The C-Network was officially founded in 2010 with nine SMEs and one research institute, with the very concrete market oriented goal of leveraging the new high efficiency LED technologies to cure UV-paint. However, shortly after the network began, the partner responsible for the final systems integration - vital for the success of the project – unexpectedly exited the network. Without suitable network replacements it proved very difficult for the D-Network manager to successfully develop the desired project. The D-Network manager tried to pivot the network strategy and identify other projects where the application of new industrial UV-LEDs could be applied. There were however two large problems in this network. On the one hand, most LED chip manufacturers were based overseas in China, and this would prove hard to integrate in collaborative projects with German companies, furthermore these manufactures were used to manufacturing on a large scale, and were not interested in discussing niche applications. This inability to propose innovations on the LED-chip, also made it harder to obtain R&D funding from incentive programs.

“Problem in this network is that the manufacturer is normally a very large firm that is not suitable as a partner. On the other hand there are a few smaller manufacturers that are very specialized. This means that they are very limited in what they can do, and their technologies. And these technologies do not fit well with our applicators. (...) There are many LED’s that can be ordered per

catalogue, but it's harder to innovate. (...) then again if we require a LED with a certain wavelength, it will be sometimes impossible to come by because of the limited technologies from the small companies, or the limited scope from the large companies” – D-Network partner

On the other hand, because of the specific network scope, it proved hard for the network manager to bring new network partners into the network. Without a critical mass of partners or ideas, and with no main project to bring the network partners together, the D-Network manager radically changed the network strategy, by broadening the network scope:

“I was worried that I would not get enough people in the network for the second phase of the network. That I would not get enough partners in, just with the UV LED scope. (...), and then it occurred to me, that we have the basic technology: electronics, optic, thermal management in the visible and in the IR wavelength. The only difference is the LED chip, and that must be imported from outside Germany anyway. (...) So I thought... let's focus this network on industrial LEDs, including all light wavelengths. I started assisting companies in developing new projects with external funding. But saying: 'I will help you find finance for your project, but for that you must be a partner of my network.' And this is how I started gathering my network partners, through R&D projects” – D-Network Manager

The network manager therefore broadened the focus of the network to application in the infrared and visible light spectrum. Partners were brought into the network when they already had a concrete R&D project idea to develop in the

network. Thanks to this pivoting in network strategy, the network was kept active. However, while this strategy definitely satisfied the needs of the partner in the short term, less emphasis was put on long-term collaborative goals. The network manager employed this kind of approach, because he was certain that the network partners were mostly interested in the network because of concrete projects:

„You have to remember 2 things. Firstly a network can be a loose collaboration, so firms can get to know each other, communicate and exchange ideas. But that does not drive the partners. Something concrete must come out of the network for them. (..) Secondly, if in fact in future they are introduced to a new business partner through the network, and they can make something like 10.000€ to 50.000€ in business, they do not attribute this value directly to the network (...). That's why before I assist the client with a project, he must sign me a network partner agreement. Once he has done this he will receive my service for the project” – D-Network Manager

Since the network manager was more focused on managing the individual projects, and satisfying the partners' interest for R&D projects, not much emphasis was placed in developing networking among partners, and a common strategy as a network whole. The D-Network manager justified this decision because of the fact that given the network partners structure, no common ground between the partners could be found:

“The network will not be sustained! Because there is not enough value for the partners. Maybe with some groups individually, it could be possible to achieve something, but these 20 partners can't do

something together...the added value is not there” – D-Network manager

According to the partners, reduced networking and common vision resulted a decreased amount of trust, information exchange and idea flow. Additionally, partners generally expressed that they did not have much in common with the other D-Network partners.

„A large challenge was that the network partners speak openly about their problems, which they really have. I am a supplier, and I understand what the competitors are thinking...if I present my problems, I do not make a good impression for potential customers inside the network” – D-Network partner

“If a network works, you learn to know companies from your industry better, and you get new contacts. But sometimes it does not work and there is not that much information exchange, especially if you do not meet regularly. (...) A network does not live alone, it only lives from a certain input. (..) Just organizing the meetings is not enough, especially if not all the partners were present. This [D-Network] was an example of a network that did not work well” – D-Network partner

“The network exists if someone says, ‘I want to take you all in the same direction’ (...) and this was not the case. (..) I think also that the network was too heterogeneous some partners were in this network, which had nothing to do with me for example some lamp-designer...” – D-Network partner

In fact, although all network partners were active in projects, attendance in the network meetings sunk very quickly. Network commitment was not perceived high by the network partners or manager. After the funded phase, the network was not sustained by the network partners (Figure 4.4). Although all network partners were active in projects, attendance in the network meetings sunk very quickly after the initial kick-off meeting of each network phase. Network commitment was not perceived as high by the network partners or by the network manager.

„The question is what do they want to do? If you want to do something decent in a network, then a partner must also be active, and think about the theme, and ideas regarding collaborative projects, or sales. Maybe also bring other partners into the network, like their suppliers. But until now I have not had one partner that is really active. They just sit there and say: ‘Hey network manager, put on a nice show’. I say ‘Yes!’ But own ideas are not brought into the project.” –
D-Network manager

In accord with insights from interviews and reports, the figure on the next page shows how network partners were not very committed towards the network as a whole. Apart from the network kickoff meetings, participation in meetings was very low in both network phases.

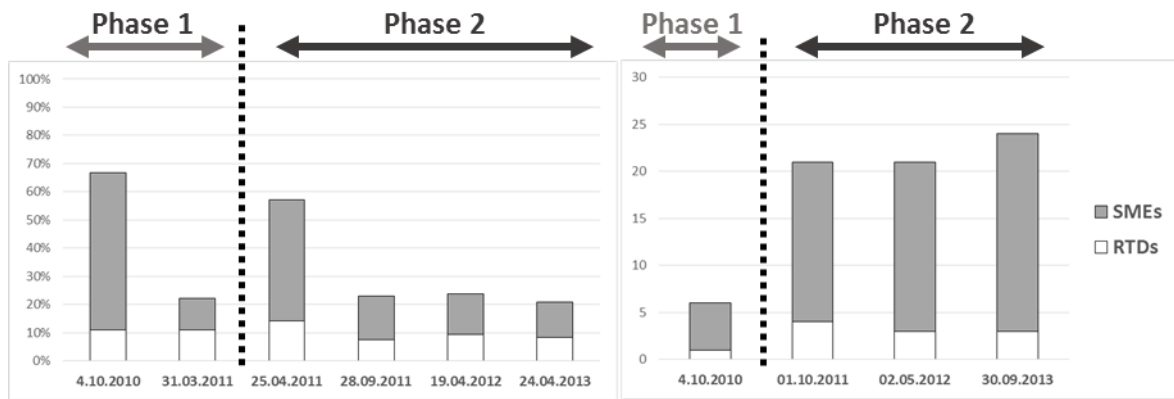


Figure 4.4 - D-Network Chart | Left – D- Network meeting participants (in % of total network members) | Right - Total number of network members. (Note: The kick-off meeting for the second phase, was held before the official time-period for the first phase had ended)

4.6 Case E

In 2010, the German Federal Government set as political goal that by 2050 80% of energy supply were to be from renewable sources. This along with the fact that the grid was based mostly on old technology, and would not be up to the task of sustaining the power-flows of distributed renewable energy production, was the main motivation for the creation of E-network.

In line with this political framework, the goal of E-network was to prepare small suppliers for the new requirements associated with a modernization of the power grid towards a smart-grid concept⁵. This network was also geared towards organizations with strengths in the area of power-electronics that wanted to enter the market as smart-grid suppliers.

Based on this rationale, the network manager brought together small SMEs that traditionally worked in the smart-grids area, and experts in the area of power-electronics GIS and net simulation. A common characteristic for all

⁵ Source: E-Network proposal

partners was that they had the common vision of jointly providing solutions for the modernization of the power grid, along with influencing policy decisions in future regarding the smart grid theme.

“Well the idea is to bring the people, which already supply old fashioned grid components, together with research institutes, which are well established with the smart grid theme, and finally with some more exotic firms, working in power electronics, that previously had nothing to do with the grid.” – E-Network manager

“The idea is to meet companies, which have the same view regarding this theme, and can contribute towards new solutions. We are talking about SMEs, (...) and there is no SME that is comparable to a Siemens or an Alstom. As a network however, we can have an impact. On the other side, we must also limit ourselves to what SMEs can actually tackle (...), we cannot compete with incumbents, and we must focus on the brand new areas.” – E-Network manager

The network was officially started in 2011 with 12 partners, of which three were research institutes. Competencies present in the network were initially system integrators, grid simulators, GIS experts, IT-developers, traditional suppliers for the electric grid and energy service providers. From early on, the network manager put much emphasis on the creation of workgroups, where network partners could focus on a specific theme, without having to fear competition. Additionally to workgroup meetings, where partners focused on concrete topics, more general network meetings were held in order to establish common ground among all network partners. The end-goal was to develop ideas, and due concrete projects to solidify the network. Firms in the network seemed

to appreciate that there was no direct competition, which fostered an atmosphere of trust:

„The main challenge was that partners were quite different. We have end-users, small start-ups, and partly established firms, and they have very different expectations of what they will do in the network, and bringing them together under the same flag was not easy...but that is normal. (..) When the network got going...it turned out ok!” – E-Network partner

„Trust in the network is OK at the moment. I can't really complain. (..) We have no competitors at the moment, especially given the areas we are working on. It is working ok in the smart grids network“– E-Network partner

According to the interviews, there was only one major issue in this network regarding the matching of network partners. The problem was that the energy service providers, did not have a strong innovation culture, and therefore proved more difficult to bring into the joint R&D projects.

“We still have a critical point on the table. (...) Smart grids are a very practical problem. And projects in which we have energy-providers, municipal companies and grid operators, are always very hard, because these end-users are very inexperienced regarding innovation. They have no employers and no budgets for these projects. (...) They have been doing things in the same way for 20 years, and are not ready to conduct projects like these. (...) There is even a case where the project has been approved with external

funding. (...) So we have 150.000€ on the table and no end-user wants it, because they have no timely resources, but also no mental resources to trust themselves with these innovations” – Network manager smart grids

Although the atmosphere in the network seemed to be generally good, commitment of the network partners slowly diminished over time, in the later stages of the network. The reason given for this was that benefits from participating began to decrease over time. On the one hand, some partners thought that the smart-grid topic had not developed as positively as they had hoped. Other partners, although still interested in the smart-grid area, expressed that the network activities were not concrete enough. Once the discussed themes were no longer considered novel and interesting, partners lost interest if things did not get concrete.

“I would have wished that the network meetings were a bit concreter, that we could take more out of it...at the moment that is not the case...I know it is hard, and one could try and address the firms goals better in order to acquire more partners...this happened partly (...).- E-Network partner

In spite of this, at the end of the last publicly funded phase a small group of partners that were used to interacting with each other decided to keep the network alive. A reduced network was thus continued after the end of the last publicly financed year, supported by three SMEs and two research institutes.

“The only future problem that I see, is a purely financial issue. That being part of the network costs money. (...) But for us it is acceptable. It's ok!” – Network partner smart grids

“The theme smart grids is a future theme, and as long as it is important, the future of the network will be safe” – Network partner smart grids

Although the network was sustained in the end, as can be seen in the figure below, network commitment gradually decreased over time. In this sense, E-Network seems to constitute the negative case, where low commitment results in a sustained network. Albeit, according to insights from the interviews, a small groups of highly active network partners were interested in continuing the network. Only the small network partner core continued the network. The network evolved from a group of 25 partners to a core group of committed six partners.

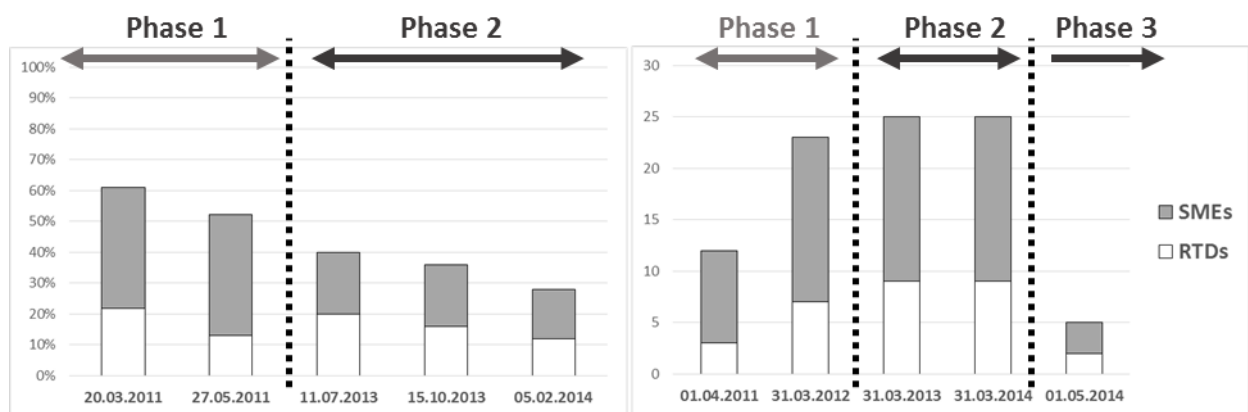


Figure 4.5 - E-Network Chart | Left – E-Network meeting participants (in % of total network members) | Right - Total number of network members

4.7 Case F

The existence of various unaddressed non-military applications for unmanned aerial systems (UAS) was the main motivation for creating this network. The three main goals of this network were to create public awareness for the extensive non-military applications of UAS in various areas, advice and accelerate the development of legislation and security responsible for overseeing

correct utilization of UASs, and finally perform research and development of new UASs and new services to be offered using UASs. The F-Network was built on a core of 10 partners from a previously existing large association. The idea to make the network more concrete and identify new partners, also interested in this theme.

“This network emerged form a parallel activity. I am also head of an association in this area. And we had several workgroups. One of these workgroups focused on unmanned aerial systems, and we had the idea of creating a network focused just on this. (...)We thought that we could also do R&D projects in this network. (...) This allowed us to make the network more concrete and also sponsored by the government. From the 30 organizations in my association, we have 10 partners in this network” – F-Network manager

F-Network began officially in January 2013, with 10 SMEs and three research institutes. In the initial phases of the network, the manager placed high importance on engaging with the network partners in order to identify their needs, and motivations for joining the network. He also placed high importance in guaranteeing that the partners were not direct competitors. Partners were distributed according to competencies and industry they were targeting with their UAS technology. This kind of detailed interaction with the network partners was of upmost importance to the F-Network manager in order to find out what intentions they had in the network, but also to follow-up the kind of network goals that had been successfully accomplished.

“What me and him discuss, somethings stay just between the two of us, and they do not come into the network. And so I can build

trust with him. There are maybe one or two points that are public, but others stay between us....we trust each other... and then it is important to make things concrete, keep a meeting minutes and a record” –F-Network manager

Aligned with F-Network’s goals the manager placed much importance on bringing new partners into the network, by matching the competencies and motivations with the network partners, but at the same time tailoring the interaction towards the partners.

“For me this is like in sales...this means I try very quickly to find out what kind of a person he is. First by e-mail, but then try quickly to have a personal conversation, so I know him and can make him offers on what best will fit him. And when I have discovered what kind of a partner he is, then I must serve him as such (...) take him seriously.”

– F-Network manager

Apart from initial partner engagement and new partner acquisition, the network manager put more emphasis in internal communication and networking in the initial network phases. The network manager created four different workgroups where partners could focus on the development of specific technological themes. These activities resulted in new ideas for collaborative R&D projects.

At a later network stage, the manager focused more on representing the network partners at conferences. His main activities at this time were internal communication, external representation, marketing and development of collaborative R&D projects.

According to the network partners, commitment seemed very strong among the network partners, mainly because of positive levels of trust, given non-existence of competition, and a strong common network vision, given the importance the network goals for the partners.

“The network partners commit themselves in various ways. For example when we make the network meetings in the partner’s facility. Normally we have extra activities like a tour of the company. Then they help with network marketing, they prepare materials, they help with the flyers by providing pictures and logos. Thirdly, I try to generate ideas in each network meeting, and they cooperate with technical ideas, in which direction do they want to go...And Fourth, which has also worked very well, is the commitment in these workgroups. I also tried to name a leader, and at the moment in one workgroup they do 80% of the work, in another just 20%...in the others it’s around 50-50.

“– F-Network manager

When prompted if the network would evolve into a third network phase, most network partners indicated that this was likely. Albeit, they expressed the wish for new projects and new ideas in the network, and that the market would become more responsive.

„Sometimes the motivation is missing, because the inputs we need is sometimes not delivered from the market (...) But the future, difficult question...I can say what I wish...I would like the network to continue with more projects. And that these projects bring new partners into the network...some fresh blood with new ideas. (...) But

under the conditions this was very professionally managed by [F-Network manager].” – F-Network partner

„In the next three years, nothing different will happen (...) the network will keep working how it’s been working now (...) policy must evolve [for UASs]” – F-Network partner

“I think it’s a good thing this network...I think we will still develop some R&D projects together (...). It’s important that we have the right people...people with good ideas, and with the resources to invest in them. Meaning innovative firms or universities” – F-Network partner

In accord with the reports from the qualitative data, the figure below shows that although network participation went down a bit in the second network phase, it remained relatively high and constant throughout the remaining time under analysis.

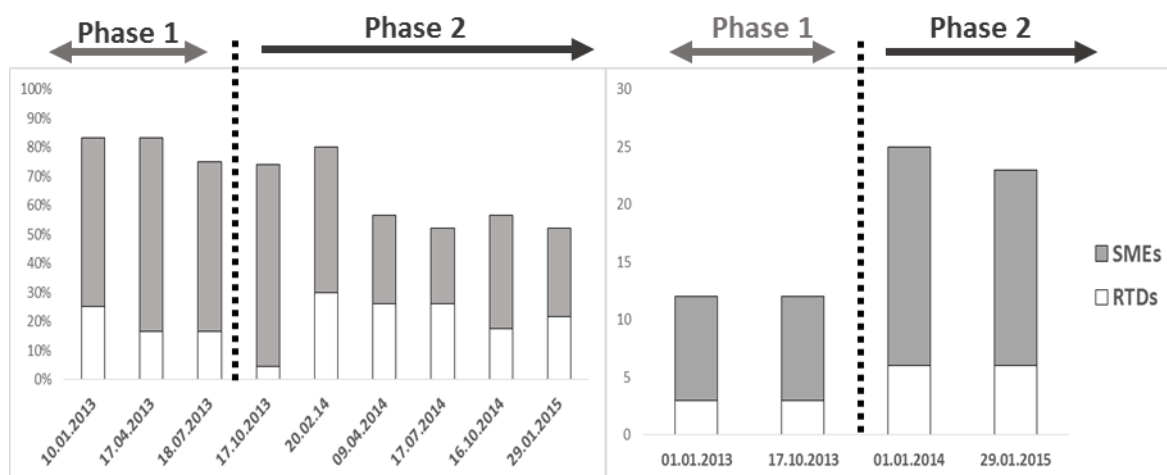


Figure 4.6 - F-Network Chart | Left – F-Network meeting participants (in % of total network members) | Right - Total number of network members

4.8 Case G

The motivation behind G-Network was the growing investments in wind

energy, especially wind energy parks in the offshore area in North-western Germany. In 2010, the German Federal Government announced that it expected to have installed 10TWh wind energy, with 32TWh being from offshore wind parks. With the rise in investment in windmills, it was expected that the need for new more efficient maintenance technologies would increase from the wind-park operators.

G-Network was thought up with the goal of developing new products to, on the one hand, decrease the costs of new windmills, and on the other hand decrease the cost of windmill maintenance. The network was officially started on July 2012, with 25 network partners, seven of which were research institutes. Later that year two SMEs exited making the final official number of partners for the first network phase 23. Partners possessed competencies in the area of aerodynamics, materials and structures, robotics, logistics, weather prediction technologies, system integration, and maintenance. Some of these partners had previous experience in supplying parts or services for the construction windmills; others were looking to develop new business in this network. It was very important for the network manager to structure the network correctly, in order to avoid internal competition and align the partners according to end-user specifications. In line with this, at network begin, the network manager put much emphasis in acquiring wind park operators as network partners, however this proved a difficult task, because the park operators were not very interested in developing new technologies that could substitute sunk-costs in current technological solutions. In parallel to partner acquisition activities, the G-Network manager placed much emphasis on brainstorming ideas in networking sessions together with the network partners. Workgroups were defined in order

to handle the themes to be created better.

„At the moment we have 27 partners, and in order to handle them better we have created five workgroups. In these workgroups the partners can dive into their preferred themes. (...) They can position themselves, discuss, and generate new technologies. (...) The workgroups are not isolated, some partners work in more than one workgroup, and it's not a closed shop. Since five workgroups are a lot of work, we may have to merge one or two workgroups.” - G-Network manager

Initially the network concept was very well received by the network partners, however, as time went by no concrete market opportunities were emerging, and therefore also no R&D projects. Partners started to lose interest in the network. In the second network phase, the network manager was still not able to acquire wind-park operators into the network as end-users. To make things more complicated, there was a role back from the Government regarding the incentives to construct new on-shore and offshore wind-parks. In spite of extensive work from the network manager in terms of developing awareness of G-Network and marketing activities, interest in the network became very low:

“I must say, G-Network is not going very well. We have a problem in the network that we can't find the right partners. It's a bit in hibernation mode. Some partners also do not come to the meetings, it's becoming very difficult. (...) We just developed one good project in this network (...). We also lost good partners with many resources like [partner A] and [partner B]...We just don't have windmill manufacturers and wind-park operators...they are deeply needed.”

The way in which the industrial and political environment affected this network was in fact extreme, as the manager writes in an official interim report:

“Over 100 companies were approached regarding the entry into [G-Network], however due to doubt and speculation in the industry investment in R&D is not a priority at the moment. (...)The large windmill manufacturers are very reserved, especially in the areas of new developments. They are entering cost-saving programs and are at the moment not interested in participating in the network [G-network]. Next to the cost-reduction pressures in this industry there is this behavior closely linked to current policy like for example comments from the Minister Peter Altmaier regarding the reform of the renewable energy law. (...) The wind industry is awaiting proper political conditions to invest in the industry. Grid connection to off-shore wind parks are still unclear. (...) After such problems much uncertainty has risen in the industry. Because of problems with financing-costs for the off-shore connection to the grid, [some firms] have already filed for bankruptcy.” G-network official interim report

Additionally to the above-referred problems, network partners added that there were already many different network active in the wind energy industry, and therefore G-network was facing competition from other networking organizations:

“Well...partner motivation....the problem is that there are many networks in this area...development of standards, but also on a strategic level. And if a CEO is going to get involved in many of them, he will not have much time to commit to them...And if in [G-network]

we are asked to contribute with some output, then we simply do not have the time for everything” – G-Network partner

As expected, the network did not continued in its sustained form after July 2015, when the network incentive finished. Figure 4.7 shows a very low network participation in the final stages of the network.

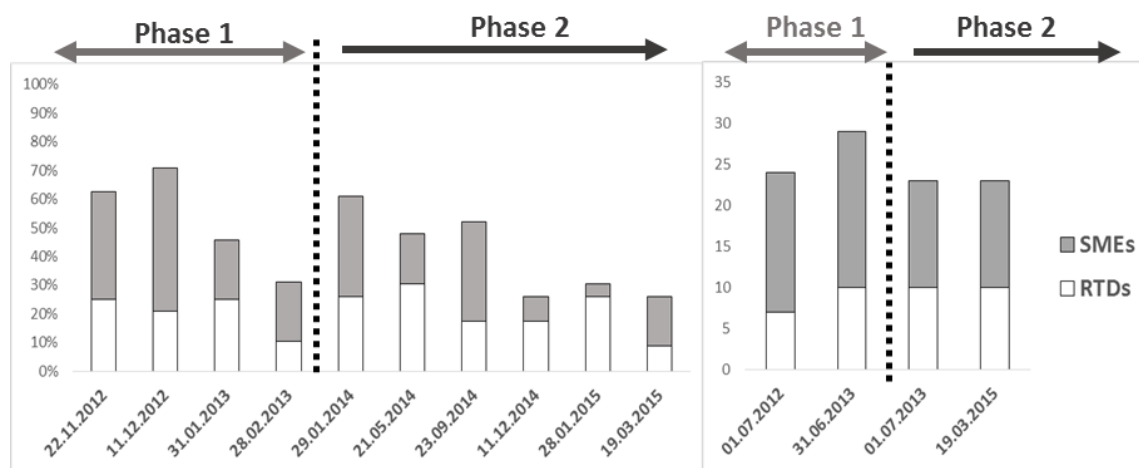


Figure 4.7 – G -Network Chart | Left – G-Network meeting participants (in % of total network members) | Right - Total number of network members

Chapter 5 - Drivers of Network Commitment: Towards Sustainment

The goal of this chapter is to perform an exploratory analysis in order to identify the drivers of commitment in the analyzed networks. A secondary goal is to corroborate that network commitment is an antecedent of network sustainment as is suggested by previous research (Human and Provan, 2000; Kramer 2014; Provan and Lemaire, 2012). First, a detailed description of the performed analysis of the data is presented. Secondly, the connection between network commitment and network sustainment is discussed along with the drivers for network commitment identified during the data analysis. Finally, proposition are derived based on empirical evidence and a discussion with the literature.

5.1 Data Analysis

As explained in Chapter Three, the collected data was initially analyzed based on open coding in order to arrive at low-level codes (Charmaz, 2006; Strauss and Corbin, 2007). Extensive memoing was employed in order to work closely with the data and conceptually develop the codes (Strauss and Corbin, 2007). In order to understand how the concept of network commitment was being influenced in the networks, a cross-case display was developed (Miles and Huberman, 1994). Conceptual mapping with C-Maps (Wheeldon and Faubert, 2009) assisted in merging similar codes, reducing the code count, and developing higher order concepts. Through pattern-matching (Yin, 2009) and revisiting the cases individually, concepts regarding the network commitment drivers were refined. Finally, to refine further the network drivers' concepts, existing concepts from the literature were consulted (Yin, 2009). Finally,

propositions were developed.

The concepts related to network commitment drivers, namely Present Value, Social Mechanisms, and Future Expectations were identified based on analysis from the data acquired via the interview guidelines (Appendixes III and IV), on field notes, and finally on data from the official network reports. The code-frequency count for each of these concepts is presented in Table 5.2. The concepts are briefly defined in the following paragraph, and then discussed in further detail in the following section (5.2).

The concept of Present Value represents how the network partner presently assesses the benefits he can extract from the network. A network regarded with high Present Value will therefore represent for the network partners a sound investment of resources. These investments may be in the form of time, financial resources or competences (Batternick et al., 2010; Paquin and Howard-Grenville, 2013).

The concept of Social Mechanisms in the analyzed cases refers to the mechanisms governing how the network partners interact with each other. The main underlying social mechanism appears to be trust (Munoz Lu, 2011), and macro-cultural norms (Jones et al., 1997). The concept of Social Mechanisms helps to explain how the network partners behave to one another in the network context.

Finally, the concept of Future Expectations represent how the network partner envisions the future of the network (Provan and Lemaire, 2012). A partner may be not extracting many benefits from the network at present time, but expect that he will reap benefits from the network in future. Conversely, a network partner may be extracting high benefits from the network presently

(high Present Value), but have low expectations regarding benefits of remaining in the network in the future.

For illustrative purposes, the table below presents examples of extracts from the data coded as Present Value, Social Mechanisms, or Future Expectations.

Table 5.1 - Coded Examples of Present Value, Social Mechanisms and Future Expectations

Concept	Coded Examples
Present Value	<p>„The largest problem with a network is that you have to systematically keep convincing them oft the value that it has for them. This question is always coming up” – B-Network Manager</p> <p>„Yes, we have contacts in the industry, and also contacts in research. And so for these themes, we get a very quick overview of what is happening...and that is a real positive” – B-Network Partner</p> <p>„ Well all the client contacts that I got, I have to say, that through the network many clients were approached. And this is very positive for us...” – A-Network Partner</p> <p>„This truck manufacturer can order between 2-3 thousand units a year. (...) He gives tips. He says if you were to build this, then I would buy it. We ca really use this (...) This is really positive for us” – C-Network Manager</p> <p>„I would like it if the partners would continue. But the partners also demand projects. Without projects, this network will be uninteresting for them. Sure they have new contacts, new partners, but this is probably not enough to keep a network like this going” – Network Manager G</p>
Social Mechanisms	<p>„ Well, the network becomes dangerous if people try to deceive each other...with that...then no one has anything, if we start stealing ideas...And them we have the idea of trust, with direct competitors. And this can be connected with the fact that partners in the network do not really match up as customers, but as potential competitors...” – G-Network Partner</p> <p>„ Well, loss of trust of discussions over patent rights...that will break a network like this...and if networks consist on partners that can't profit from each other... This develops with time...For example with [Company X] we have some work together, and we are going to keep working together” – D-Network Partner</p> <p>„Hard... I do not know...if people feel good with each other, if they are happy to meet at the meetings again, then people automatically commit to the network...” – E-Network Partner</p> <p>“So deadly for a network is if you misuse other people’s trust in a network...and if we only see what the network can do for us, and not what we can do for the network...(…) The motivation will disappear” – F-Network Partner</p>
Future Expectations	<p>„The future of the network? ...no idea, it depends what the network manager can offer us...No honey, no money...that is how it is” – B-Network Partner</p> <p>„The expectations were that we develop interesting R&D projects and that collaboration develops between the partners. And that the network becomes so attractive, that new partners arrive at the network” C-Network Manager</p> <p>„The problem is that this network requires a lot of time, and the output of the network is often lower that I had hoped...especially regarding applications...and regards new things that we could do” D-Network Partner</p> <p>“This network should bring the possibility of finally allowing autonomous flight for civilian applications...The problem is that in Germany and in Europe we cannot get a permit, because there is currently no legislation that enables government bodies to grant the permit. If today I go to a regional government body and say that I want a permit to use an AUV to monitor a pipeline for instance...then I would not get a permit for this...They say we can only fly under visual human supervision...it is therefore not interesting... One of the goals as a network is to develop technical specifications for the creation of legislation. Only the will it be possible to develop policies for the attribution of flight-permits...” – F-Network Partner</p>

The table on the following page presents the code-count for each of the network driver concepts, in each analyzed network. This allows to better

understand the distribution of the data in each case study.

Table 5.2 - Code Frequency Matrix – Commitment Drivers

	Present Value	Social Mechanisms	Future Expectations	Total
A-NETWORK	13	16	16	45
B-NETWORK	10	18	18	46
C-NETWORK	28	36	20	84
D-NETWORK	11	13	32	56
E-NETWORK	15	19	17	51
F-NETWORK	18	35	14	67
G-NETWORK	25	16	17	58
TOTAL	120	153	134	407

Looking at the table above (Table 5.2), it is possible to observe that the codes are evenly distributed among the individual case studies. The higher code count from C-Network and F-Network is accountable for given the higher network manager interview length. In particular, for C-Network and F-Network, the code count is relatively higher for the concepts of Social Mechanisms. This is expected, since these network managers stressed the importance of establishing positive relationships among the network partners and avoiding situations of internal competition among the network partners. These aspects are examples of themes coded as Social Mechanisms. The relatively higher code count in regarding Future Expectations in D-Network is related to feedback from the network partners referring to a lacking network future common vision.

While the code count allows to rapidly uncover inconsistencies in the data, or more occurring themes in the networks. It is the more qualitative analysis that allows understanding what the underlying issues in the cases are. The Table 5.3 shows a cross case display for the case studies, based on the information presented in Chapter Four. The table includes a summary of the network goals

and main shaping events, along with a qualitative assessment of network commitment along with the issues that affected it. This data shall be used in the following section (5.2), when discussing the drivers for network commitment.

Table 5.3 - Cross-Case Analysis - Commitment Drivers

Network Name	Motivation / Opportunity	Network Goals	Initial network creation approach	Outcome after official funding phases	Network Partner Commitment	Issues affecting network partner commitment	Shaping Events
A	- Concrete product opportunity in the IT sector	- Development of product for concrete market application	- Network manager contacted several network partners, he had good relationships with. - Partner's selection was based on partner competencies, and cultural norms.	- Sustained - Network evolves into a sustained joint venture. Other network partners are invited to participate in sales-projects as complementary.	-Very high network commitment along the entire three years	(+) Most companies already knew each other (+) Good intentions, clear conscience and high levels of trust with good "chemistry" (+) Common goal of bringing product to market	- Importance recognized of bringing service providers as end-users into the network, to help with sales project - Substitution of two network partners because they were just interested in own benefit.
B	- New political framework, favorable for new renewable energy sources	- Application oriented innovation and research, with focus on technology transfer	- Network scope was held very broadly. - Many network partners that were previously unknown by the network manager. - Network partners entered the network based on interest for the broad topic.	- Collapsed - Although network manager performance is praised, interest in maintaining network activity is not enough.	- Initially high network commitment. - Lower commitment in the final stages, especially from the SMEs.	(+) High profile, informative events with many attendees (+) Relationship with network manager (-) Needs of the industry could have been better focused at the end (-) Network drying out of interesting theme (-) Low trust among the network partners as a whole. (-) Some accounts of competition among partners	- After obtaining a large partner base, importance shifted to engaging with the partners, and determine their interest. - Emphasis on public relations work in second stage of the network - SMEs begin to lose interest in the network
C	- Political framework favorable to electric vehicles. - OEM suppliers motivated to have own product.	- Develop and commercialize EAX. - Develop other products related for electric vehicles	- Partners were selected based on personal relationships developed by the network manager over 20 years in the automotive business. - Partners were selected based on competencies and interests in the e-vehicle field	- Sustained - Group of nine SMEs and four research institutes, mostly out of the EAX project choose to continue funding of the network management organization.	- Initially high network commitment, diminished a bit in the final year of the network	(+) Trust and camaraderie (+) Truck manufacturer as End-user (+) Involvement in concrete projects (-) Network themes getting exhausted (-) E-vehicles not as popular as anticipated	- Large truck manufacturer interested in the EAX - Electric vehicle market, did not emerge as expected

D	<ul style="list-style-type: none"> - Concrete business opportunity regarding a new product for curing paint with UV, based on LEDs 	<ul style="list-style-type: none"> - Develop LED based UV paint curing solution with network partners having different competencies 	<ul style="list-style-type: none"> - Partners were selected based on a very specific skill required for the concrete project 	<ul style="list-style-type: none"> - Collapsed - No more networking activity exists after official funding phase. Both network managers and network partners realize there is not enough commitment to continue network. 	<ul style="list-style-type: none"> - Overall low network commitment regarding the network as a whole. 	<ul style="list-style-type: none"> (+) Concrete projects (-) Competition and low trust (-) Low sense of common direction (-) Low sense of belonging 	<ul style="list-style-type: none"> - Vital network partners exited the network early on - Network scope broadened to increase partner base - Focus on individual projects
E	<ul style="list-style-type: none"> - New political framework favorable for smart grid technologies. 	<ul style="list-style-type: none"> - Develop new products and services for the smart grid market. 	<ul style="list-style-type: none"> - Network partners were based on interest on the smart grid topic. - Selection criteria for partners was somewhat broad, albeit with some focus on the core competency 	<ul style="list-style-type: none"> - Sustained - Small group of three SMEs and two research institutes choose to continue funding of Network Management on their own 	<ul style="list-style-type: none"> - Ok network commitment at the beginning of the network, which gradually diminishes over time 	<ul style="list-style-type: none"> (+) Establishing common direction among network partners through networking and discussion (+) Concrete projects (+) Small group of partners believes in future of smart grids (-) Concrete outcomes not enough (-) Themes drying out 	<ul style="list-style-type: none"> - Energy service providers as end-users had low innovation culture - Smart Grid theme lost political importance
F	<ul style="list-style-type: none"> - Low awareness regarding UAVs in the general public - Unclear /non-existent legislation regarding civilian use of UAVs - Opportunity for the development of new projects 	<ul style="list-style-type: none"> - Provide a common place for companies and research institutes active with UAVs to exchange information and raise awareness of the emerging possibilities with UAVs 	<ul style="list-style-type: none"> - Network partners are gathered mostly from previous relationships with the network partner - Gather network partners with different competencies related to the UAV theme. Strong focus in guaranteeing that network partners are complementing each other, and not in direct competition - Partners are divided vertically along the network's value system and horizontally according to application market. 	<ul style="list-style-type: none"> - Most likely sustained - Network partners seem to find the network interesting, and there is no indication in the interviews that network would end 	<ul style="list-style-type: none"> - Generally good network partner commitment 	<ul style="list-style-type: none"> (+) Good relationship between manager and partners (+) No direct competition (+) Concrete projects (+) Representation of network partners a whole, and when required individually 	<ul style="list-style-type: none"> - Network partners work well together - Partners are becoming increasingly autonomous in workgroups - Interest in external representation

G	<ul style="list-style-type: none"> - Initially planned large investment in offshore energy parks from German government - Identified need to reduce costs in wind-mills 	<ul style="list-style-type: none"> - Develop new cost-saving technologies for wind-mill development and maintenance 	<ul style="list-style-type: none"> - Network partners interested in the theme of wind-energy are brought into the network 	<ul style="list-style-type: none"> - Most likely collapsed - Lack of projects and public interest due to problems in the industry makes it hard to bring the network further 	<ul style="list-style-type: none"> - Partner commitment declined during network development - At the end very low network commitment reported 	<ul style="list-style-type: none"> (+) Interest in the network theme (+) Opportunity to develop business in the energy wind-mill area (-) Lack of competencies in the network to develop the products (-) Lack of possibility to establish connection with large industry players (-) Uncertainty and de-investment in the industry 	<ul style="list-style-type: none"> - Change in government policy towards offshore wind-parks
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The concept of network commitment was assessed qualitatively using the interview guidelines in appendixes III and IV. The network managers were probed regarding how the network commitment changed over time and how they could recognize that a partner was committed to the network (Appendix III). Network partners were probed on their own commitment, and on the commitment of the other network partners (Appendix IV). Additionally, they were probed in how they themselves showed network commitment and how they recognized how the commitment of the other network partners. These lines of data inquiry allowed for a very rich understanding of network commitment and a good qualitative assessment of the concept. In order to increase the validity of the network commitment further, this concept was also assessed quantitatively, based on the change of network meeting attendance over time. As seen in the literature review, network-meeting attendance has been described as a proxy to network commitment, and even used an assessment of the concept (Andrésen et al., 2012). Information contained in the network commitment graphs (Figures 4.1-4.7) was aggregated in a single figure (Figure 4.8). The variation of network commitment over time is displayed for all networks in Figure 4.8. Each data-point represents a network meeting. In order to compare the different networks more easily, network meetings from different networks occurring within the same 2 months were centered on the same horizontal scale point.

In some cases, such as the E-Network, the graph finishes around the 2.25-year line. This simply indicates that no more meetings were held during the network's funded phase. It is not therefore an indicator that the network is finished. On the other hand, for F-Network and G-Network no further network meetings can be registered after the 2.5-year mark because the networks were

still ongoing, at the time of the case study. It is also apparent, that some networks have a spike in network attendance around the 1-year mark. This is expected since this is the beginning of the second funding phase. At the start of the phases, a network kickoff meeting had an expected higher number of network partners.

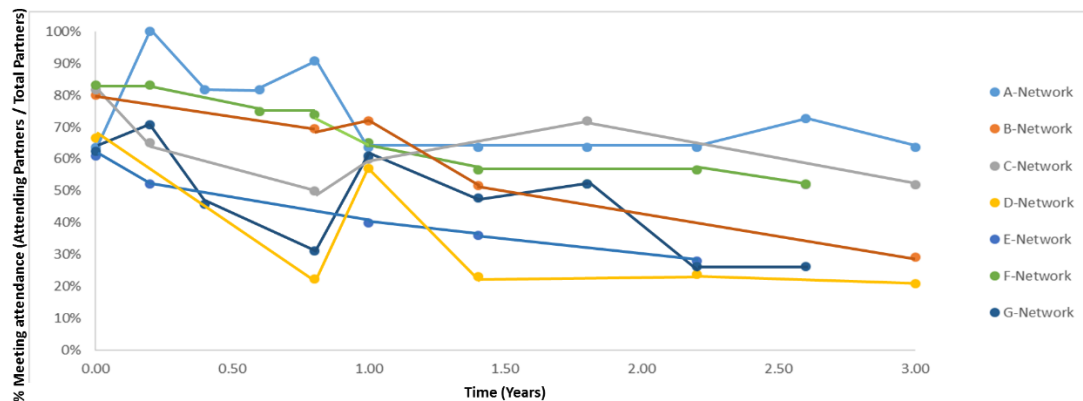


Figure 4.8 - Network meeting participation over time for all network cases

Looking at the data, it is possible to see that networks A, C and F maintain a stable and relatively high commitment level in the final network stage. Conversely, the commitment in networks B, D, E and G decreases over time. This happens somewhat abruptly for networks D, B and G and somewhat gradually for networks E. Networks A, C and E evolved into a sustained network form, whereas networks B and D collapsed at the end of the funding phase. Networks F and G were not followed until network end, but according to interviews with network partners F-Networks is expected to have a high chance of evolving into a sustained form, and G-Network is almost definitely expected to collapse after the end of the phase 2 funding period. With exception of E-Network, which had a strong network core, all networks that had lower levels of network commitment collapsed after the funding phase failed. The connection between network commitment and network sustainment will be addressed in more detail in the following section (Section 5.2.).

5.2 Discussion

This section addresses the results from the cross-case analysis while at times highlighting particular findings from the individual cases. The focus is on the drivers of network partner commitment, and how these may have influenced the network end-result. Some networks became sustained organizational forms, and others ceased to exist after the ZIM-NEMO policy funding. Based on the data collected here, as well as on insights from the literature, the identified drivers of Present Value, Social Mechanisms and Future Expectations will be described next. Propositions related to each driver are presented throughout the following sections.

5.2.1 Network Commitment and Sustainment

By focusing on the cross-case summary in Table 5.3 and the network commitment data in Figure 4.8, it is possible to conclude that there is a strong link between higher levels of network commitment and the network sustainment. Both network that actually collapsed after the three-year funding period had lower levels of commitment according to network partners, network managers and the indicator based on the network meeting attendance.

D-Network was the case where network commitment decreased the fastest. With exception to the first- and second-phase network kickoff meetings, network-meeting attendance was very low with constant tendency to decrease. As expected, the network was not continued after the second phase ended. Conversely, B-Network actually had higher levels of commitment during the initial network stages. B-Network was initially attractive to network partners because of the high profile events, and the influx of novel information from the

large events. However, according to network partners, comparably less emphasis was given to new network projects and – especially SMEs - began to lose interest in the network because of the lacking concrete tasks, and to weak social connections. The B-Network case does in this sense share some similarities with one of the networks analyzed longitudinally by Human and Provan (2000), namely the network in which the network manager developed the network initially with greater emphasis on external legitimacy. This network collapsed, contrarily to the second network where initial attention was initially placed on internal legitimacy. As with D-Network, B-Network also collapsed after the second funding phase.

Although not fully concluded at the time of the study, information from interviews with managers and partners from G-Network also indicate that it will not evolve into a sustained form. As expected, network commitment in this network was not expressed as particularly high. As seen in Figure 4.8 network meeting attendance is relatively low, especially in the later network stages. Attendance does in fact rise at the beginning of phase 2, but then quickly diminishes at the end.

Contrasting with networks B, D and G, A-Network had the highest and most stable network commitment throughout the funded three years. Not only did the network evolve into a sustained form, the network evolved into a legal entity, namely a joint venture in which most network partners were stakeholders. C-Network also displayed signs of high network commitment, according to the interviews. According to the network meeting attendances, with exception of a meeting hosted at the end of the first network phase, attendance was consistently high throughout the network development. Accordingly, the network evolved

into a sustained form, where network partners supported the network manager activities without any further funding incentives. Although not concluded at the end of the study, based on insights from the case studies, F-Network will most likely result in a sustained network form. As expected, network commitment was considered high during the development of this network, additionally attendance in the network meetings, although lower in the second network phase continued to be relatively high.

The negative case in this study is E-Network, despite low partner attendance in the network meetings, the network still evolved into a sustained form. This may initially seem conflicting evidence when compared to the previously presented cases. However, according to the interviews, a core group of network partners that was highly committed towards the network. This smaller group decided to take the network further, into a sustained form. This finding, points to the fact that a single quantitative network commitment index may be misleading, and a more fine-grained analysis could provide further insights. It does not however put in question findings from the other cases analyses for this study.

Clearly, from the evidence presented above it is important to conclude that high network commitment is a strong indicator of network sustainment. These findings validate previous studies, which hypothesize that network commitment is positively related to long-term collaboration (Andrésen et al., 2012), and resilience (Kramer et al., 2013). The following proposition is therefore derived:

Proposition A: Network commitment is positively related to network sustainment.

5.2.2 Present Value

The fact that the network delivered value for the network partners in the context of their business activities was an important driver for network commitment in the analyzed cases. Commitment towards network activities and recurrent participation in the network meetings was directly linked to the network creating value for the network partners' businesses. Creating value for network partners can be a hard challenge. Because of the novel and evolving activities and goals in a network the question of how it can create value for network partners is surrounded by uncertainty (Paquin and Howard-Grennville, 2013). Previous research stresses the fact that in network orchestration it is necessary to engage with the network partners in order to iteratively determine how best to create value for them (Capaldo, 2007; Hite and Hesterly, 2001; Human and Provan, 2000; Möller and Svahn, 2009). This iterative search approach for how to add value for the network partners can result in apparent dilemmas in network orchestration such as establishing internal legitimacy (Human and Provan, 2000) among activities while also attracting potential partners (Paquin and Howard-Grennville, 2013).

The A-Network possessed high levels of network commitment given direct commercial benefits the network partners could extract from the network. In C-Network commitment declined after the truck manufacturer withdrew interest from the network partner. In D-Network, one of the end-users leaving the network was almost responsible for the network collapsing instantly, had it not been for the quick adjusting strategy of the network manager. In the later stages of B-Network, SMEs started to lose interest in the network because not enough concrete projects were being generated. One of the recurring themes about the

failure of network commitment was that partners had “more important things to do at the time” (Network Partner – B-Network).

Notably, SMEs are known to be very busy with their daily business (Gausdal, 2013) and suffer from a lack of funding for innovation activities (Caputo et al., 2002). Pressured to transform invested resources quickly into concrete business, they also share a short-term perspective of management (Batternick et al., 2010; Nooteboom, 1994). Previous literature in fact recognizes that SMEs prefer cooperating for commercialization than for creation (Geum, et al., 2013; Katzy et al., 2013), although they attribute this fact mostly to the fear of a loss of competitive advantage. The data does not rule this out, but it also suggests that a core reason is the pressure to turn invested resources into revenue. It is therefore concluded in this study that in innovation networks relying much on SMEs, it is important that network goals be well aligned with SMEs’ more immediate business goals. In terms of research institutes, this problem was not so apparent mostly because the development of new research projects is better aligned with the everyday business goals of research institutes and universities. The following proposition is therefore derived:

Proposition B1: Network goals aligned with network partner’s immediate business goals is positively related to network commitment.

Interviewed network partners repeatedly indicated that sometimes network outcomes and activities were not concrete enough. While these kind of comments were identified in all networks as being linked to a decrease in network commitment, in B-Network and E-Network these comments were expressed more often. Especially SMEs expressed that it was important to get past getting to know the network partners and develop concrete outcomes by

solving concrete problems. Network partners, especially SMEs that left the network meetings with no concrete project plan or work plan, felt that the network was not achieving much for them. Accordingly, C-Network and D-Network managers greatly emphasized the need for activities in the network to be concrete and to the point. These two managers along with the manager from A-Network emphasized the importance of triggering relationships through concrete projects, not just informal meetings. In Olsen et al.'s (2012) analysis of 101 networks active in the food industry, concrete problem solving is identified as being one of the main reasons why networks succeed. In their analysis of SME-preferences in innovation networks Lefebvre et al (2014) determine that network partners prefer networks focused on concrete innovation development over networks focused on managing network partner relationships. This delivers the following proposition:

Proposition B2: Practical problem solving activities are positively related to network commitment.

B-Network featured in its meetings many presentations with latest technology developments in the industry. As with the other analyzed networks, the network partners valued the new insights and ideas they could access to through participation in the network. In the initial network phases the network provided brokerage between previously unconnected partners, thereby bridging structural holes (Ahuja, 2000). This allowed for the exchange of novel information in the network. When after some time new partner entry was reduced, the flow of new information in the network diminished. As the networks matured, partners commented that the “themes of the network were getting exhausted” – Partner E-Network, and that “fresh blood was required in the network”- Partner C-

Network. Klerx and Aarts (2013) emphasize the importance of balancing old and fresh ties in a network. Like Ahuja (2000), Partanen et al. (2011) stress the importance of networks with weak ties and structural holes in regards to access to new information. Finally, Menzel and Fornzahl (2009) explain the demise of large clusters due to the lack of absorptive capacity. This leads to the following proposition:

B3: Lack of novelty is negatively related to network commitment.

5.2.3 Social Mechanisms

In naturally emerging innovation networks, Social Mechanisms allow for a governance system without hierarchical authority or complete contracts. This form of governance is based on social embeddedness (Jones et al., 1997; Uzzi, 1997). Embeddedness explains how dyadic and network social relationships constrain economic action (Granovetter, 1985). Granovetter (1992) builds on his seminal work and distinguishes between relational embeddedness and structural embeddedness. Relational embeddedness focuses on dyadic ties, whereas structural embeddedness focuses on the network of social ties in which the individuals are inserted. Jones et al. (1997) state that Social Mechanisms, responsible for governance in naturally emerging networks, have as a foundation structural embeddedness. More recently, Capaldo (2014) extends Jones et al.'s, (1997) view by distinguishing between relational social mechanisms (e.g. trust and inter-organizational relationships) and structural social mechanisms (e.g. macro-cultural norms). Although previous research indicates that a high degree of trust takes a long time to build (Munoz Lu, 2011), strong relationships have been reported to develop rapidly in other cases (Gardet & Mothe, 2012). Evidence from our cases suggests that both relational social mechanisms and structural

social mechanisms can be considered as drivers for network commitment. It is important to note that while relational social mechanisms refer to dyadic relationships in the top-down network, structural social mechanisms refer to the macro-cultural norms existing in each network partner's environment or industry.

The industry and the associated cultural norms in which the network partners were embedded played an important role in network commitment. For instance, as reported by the C-Network manager, the network partners from the automotive industry were already used to working with each other. This resulted in higher commitment regarding collaboration in the network activities. In the A-Network, the network manager reported the network partners fitted together because they were from similar industries. Contrastingly, partners from the D-Network justified their low network commitment in networking activities because of "other network partners (...) [that] had nothing to do with [them]" – network partner D-Network. In the E-Network, a huge difference in innovation culture from the energy providers proved a challenge in committing them to network R&D activities. This brings the following proposition:

Proposition C1: Similarity in partner cultural norms is positively related to network commitment.

In the analyzed cases, dyadic trust between the network partners was an important relational social mechanism that appeared to influence network commitment. Expressions such as "without trust, we have nothing in the network" were not uncommon. While trust was considered highest in the networks with a high level of network commitment, lower levels of trust were indicative that the network was not functioning properly. Both ability trust - "the

trustee may be highly competent in some technical area, affording that person trust on [related] tasks” - and integrity trust – “trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable” (Mayer et al., 1995) - were present. Ability trust played an important role in the desire to collaborate and work together on concrete projects and activities. Integrity trust played a part in the desire to share information. Integrity trust seemed to mitigate the fear of opportunism. Opportunism is defined by Williamson (1973, p317) as “an effort to realize individual gains through a lack of candor or honesty in transactions” and has previously been associated to network failure (Schrunk and Whitford, 2011). Although no descriptions of actual accounts of opportunism were present in the case studies, the network partners suggested this concern hampered communication between network partners, especially when direct competitors were present in the network. The following proposition is therefore derived:

C2: Both ability and integrity trust are positively related to network commitment.

Another form of a partner taking advantage of the network is free riding (Batternick et al., 2010; Gausdal and Hildrum, 2011; Ritala et al., 2012; Wincent et al., 2013). Free riding occurs when a network partner takes advantage of the network benefits but does not provide any inputs. While, contrary to opportunism, this does not negatively affect others, network partners may find it unfair that others are benefitting but not contributing. As described by Sol et al., (2013), it is important to cancel out the ‘wait and see’ behavior that could emerge, and establish instead an environment of reciprocal communication. In fact, in our cases free riding was repeatedly considered by the interviewees as an obstacle for networking activity. More extremely, the network partners commented that a ‘wait and see’ environment in a network would be self-enforcing if not

adequately addressed. In order to address this problem quickly, A-Network manager for instance removed network partners that exhibited this kind of behavior in order to ensure a good working environment. Contrastingly, the B-Network manager chose to have many external information contributors participating in the network. To a certain extent this constant influx of new informants, mitigated the perception that network partners were performing free riding in the network. The following proposition is therefore suggested:

Proposition C3: The perception of free riding will be negatively related to network commitment.

5.2.4 Future Expectations

Network brokerage in connection to innovation has been previously described as ‘missionary work’ (Klerkx and Aarts, 2013). In their literature review on innovation brokers Klerkx and Aarts (2013) state that acquiring network partners can be challenging given the partly intangible benefits that networks present. All of the interviewed network managers mentioned difficulties in initially ‘selling’ the network concept to potential partners. In such cases, the sometimes-intangible benefits of participating in the network must be made clear to the network partner. If network benefits are however oversold, then there is the danger that the network partners have unrealistic expectations. When Future Expectations are then not met, network commitment will gradually fall over time. Future Expectations need to be successfully managed by network managers (Olsen et al., 2012). If not, partners may slowly abandon the network over time due to frustration, as expressed by a D-Network partner: “*A lot was promised and assured, but the end-result did not live up to the expectations.*” Unlike research institutes which can be more patient network partners, “*if in 6*

months nothing concrete comes out for the SMEs, they will start to exit the network” – Network Partner B-Network. In fact, in all networks except the A-Network case, there were accounts of a gradual decrease of network commitment due to unmet Future Expectations. Interestingly, interviewed network partners with experience in previous networks had more reasonable assumptions regarding what to expect out of the network, and were therefore more forgiving when things did not go exactly as planned. This brings the following proposition:

Proposition D1: The existence of partners with unrealistic expectations is negatively related to network commitment.

While achieving immediate goals in the network was important in order to ensure that Future Expectations are met, the promise of attaining future common goals was an important factor that helped bring network partners together in the long run. In the network cases, a future network vision ensured that the network partners expected future value from the network, and therefore remained more committed, even if network goals were not fully met in the short term. As reported by the network partners from the D-Network, the main factor responsible for the lack of commitment here was that there was no future vision or direction for the network. At the end of this network’s funding phase, the network partners did not have many future expectations for the network. When in C-Network it became more evident that the future of electric vehicles was not as positive as expected network commitment began to decrease gradually. Contrastingly, A-Network possessed a strong network vision and accordingly the highest and most enduring network commitment. According to Huggins (2000), a distinguishing characteristic between failed and successful networks is the coherence of the network sense of direction and identity. More recently, Provan et al. (2012) state that a network mission is important for the emergence and

development of a network. In his literature review concerning leadership in inter-organizational networks, Müller-Seitz (2012) points out the importance of a network vision or common agenda. A shared vision gives a network joint direction (Abrams et al., 2003; McAllister, 1995). In accord, Still et al. (2014, p248) accurately describe the importance of a network vision in that it “*allows [the network partner’s] independent decisions to synergize change and transform the present into a shared future.*” In light of this, the following proposition is derived:

Proposition D2: Strong network vision is positively related to network commitment.

Some studies conclude that a network partner committing resources to a network is a sign of network commitment (Doz et Al, 2000; Provan and Lemaire, 2012). Case findings suggest however that this is not always the case, and may depend on how resources are being committed. In the analyzed cases, the mandatory payment of network fees had a negative effect on network commitment. Although network partners did in fact agree to pay the network fees, some saw this as a sign that they were purchasing a service from the network manager. Partners that saw the network merely as a purchased service expected value for money ‘invested’ in the network. As explained by a B-Network partner queried regarding his commitment towards the network: “*That depends on the costs and the projects we are promised. No honey, no money... That’s how it is.*” According to our cases, network partners that regarded the network as a purchased service were not as committed as others were. The D-Network manager explains this as follows: “[These partners] just sit there and say: ‘Hey manager put on a nice show’ I say: ‘Ok!’, but they do not bring new ideas in the network.” Thus, the following proposition is presented:

Proposition D3: Network fees are negatively related to network commitment.

Based on the above discussions, Figure 5.1 presents an empirically grounded conceptual framework with the presented propositions, network commitment drivers, and connection to network sustainment.

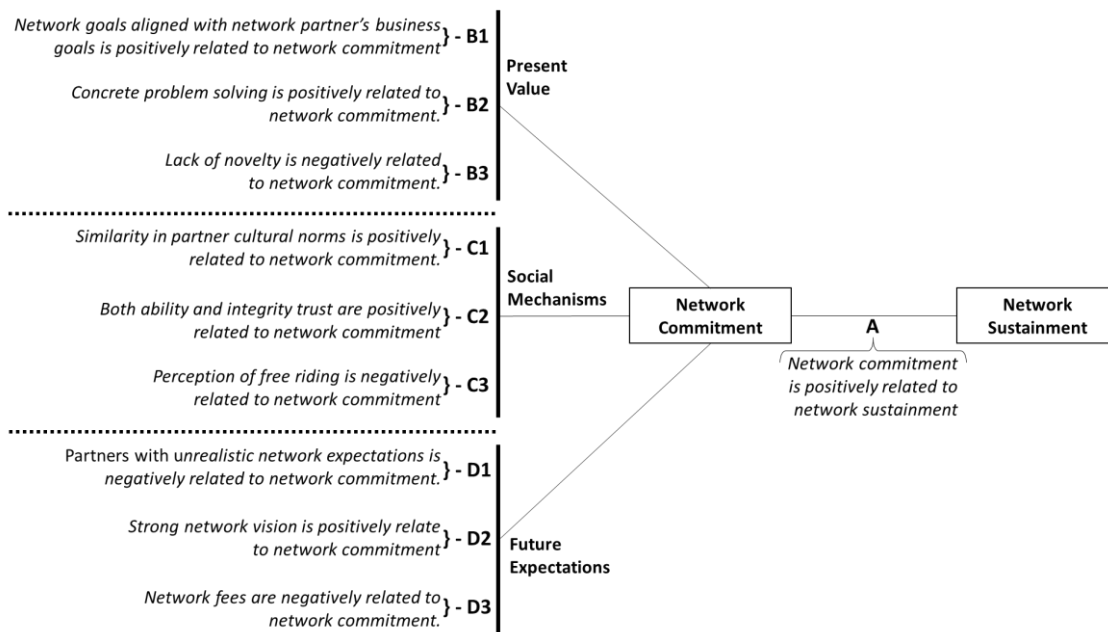


Figure 5.1 – Empirically Grounded Conceptual Framework

5.3 Conclusion

Due to the political and economic importance of developing long-lasting sustained innovation networks, this chapter focusses on the connection between network commitment and network sustainment. A second goal was to address the clear knowledge gap regarding network commitment by identifying its drivers in top-down innovation networks.

It is shown that network commitment played an important part in assuring that the analyzed networks were sustained even after the network incentive had ended. Additionally, the main drivers of network commitment - namely Present Value, Social Mechanisms (trust and macro-cultural norms), and Future

Expectations - were identified.

The following chapter builds on these findings, namely the identified network commitment drivers. Looking at the network management, a connection is established between network management and network commitment. This will bring the present research one step further towards a framework focusing on developing network commitment through network management practices.

Chapter 6 - Managing for Network Commitment

Building on the findings from previous chapter, the present chapter focuses on how the drivers for network commitment can be influenced by network management during the network creation and development process. First, this chapter develops a conceptual model for analyzing the management of innovation networks through a literature discussion, and with insights from the network cases. Secondly, the relevant data from the cases and analysis methods are introduced in detail. Thirdly, based on the developed framework, the present chapter derives propositions on how network management is able to influence the network drivers identified in Chapter Five – namely Present Value, Social Mechanisms and Future Expectations. Finally, through a cross-case comparison of how the networks were managed, three general strategies for creating and developing innovation networks are introduced: Project Driven, Synergy Driven and Representation. Next, the conceptual model for classifying the network management is presented based on discussion with the literature and data from the cases (Corbin and Strauss, 2009).

6.1 Conceptual Model for Managing Innovation Networks

The conceptual model for managing top-down innovation networks is built on the conceptual discussion described at the end of section 2.3, distinguishing between network context, network design and network operation. Figure 6.1 presents the detailed conceptual model that will be discussed based on literature and insights from the case studies.

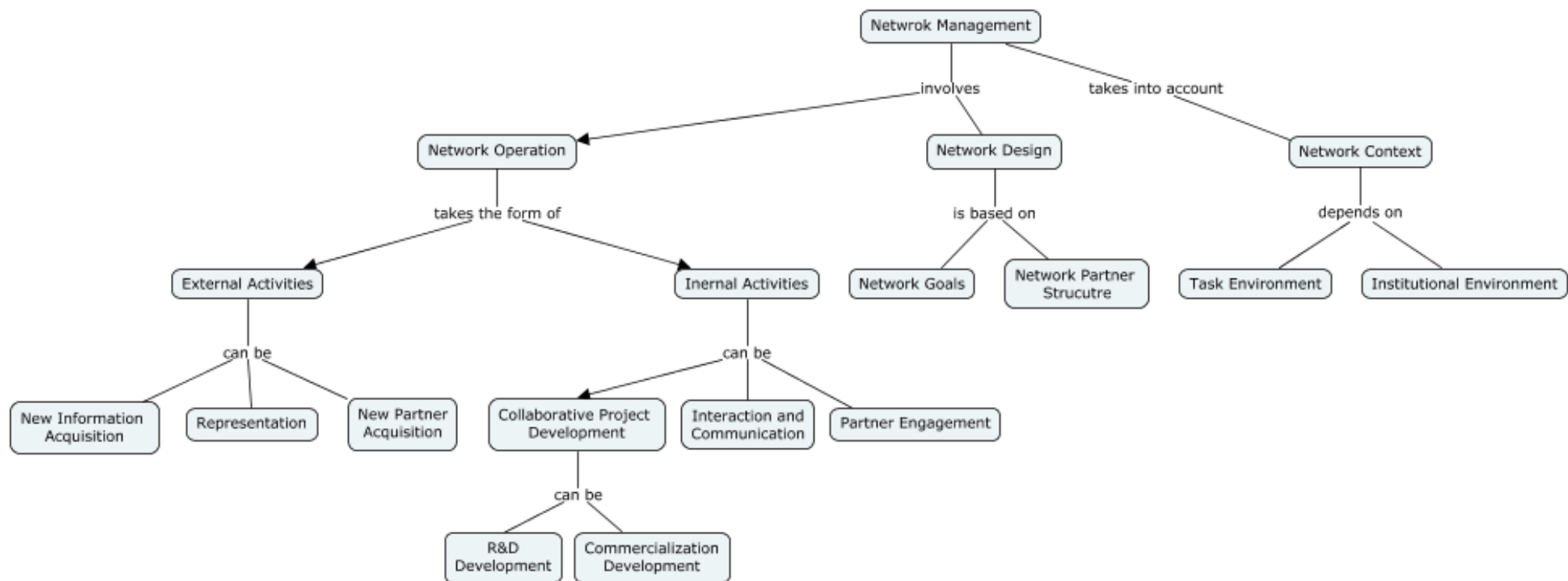


Figure 6.1 - Network Management Conceptual Model | Based on literature and case evidence

6.1.1 Network Context

The environment in which the network is created inevitably shapes its development. It provides the context in which the network can be designed in terms of goals and activities, and frames the network activities for everyday operation. Oliver (1997), in his seminal work combining the resource based view of the firm (Wernerfelt, 1984) with the institutional view (Meyer and Rowan, 1977) and their role in a firm's competitive advantage, distinguishes between the role the institutional environment and the resource environment – referred to as the task environment - have on organizations (Oliver 1997).

The institutional perspective (DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Zucker 1987) states that organizations conform to societal and political norms. In a practical sense, organizations are on the one hand, constricted by laws, regulations, monetary incentives, and cultural norms embedded in their industrial environment. On the other hand, organizations also actively strive to conform to institutional norms in order to gain legitimacy and support (Meyer and Rowan, 1977). Examples of institutional environments affecting the analyzed network cases are for instance the role government policy played in shaping the developments of G-Network and in B-Network. In the case of G-Network the government's statement regarding how Germany would be investing in offshore wind-parks sparked the interest of many companies in the topic in early stages of G-Network. A similar occurrence was noticed with B-Network, as government stated that the energy-efficient use of biomass was of national strategic interest. A contrasting example lies with the F-Network case. In this case, although funded with R&D incentives, public awareness and suitable legislation for the civilian use of UASs was very low. UASs were seen more as a

military application. A goal of F-Network was therefore to influence the institutional environment by raising awareness and creating legislation for civilian usage of UASs.

Contrastingly, to the institutional environment, the resource based environment perspective – named task environment by Oliver (1997) – is defined as strategic factors of the industry related to control over resources, buyer supplier relationships, and industry and market structure (Oliver, 1997; Oliver, 1991). In this case, research tends to focus on the environment's influence of the companies' ability to acquire and control scarce resources for competitive advantage (Oliver 1997; Pfeffer and Salinick, 2003). Examples of the task environment affecting the analyzed networks is for instance when for D-Network LED manufacturers were unavailable inside Germany, thus making it hard to have a complete vertical structure inside the network. Another example for the task environment influencing the analyzed networks was when for C-Network and A-Network a concrete market already existed for the products and services under development in by the network. Figure 6.2., adapted from Oliver (1997) summarizes the differences between the institutional environment and task environment.

<i>Relevant dimensions</i>	<i>Institutional environment</i>	<i>Task environment</i>
Environmental context	Political and legal	Market
Key demand factor	Legitimacy	Resources
Type of pressure	Coercive, mimetic, normative	Competitive
Key constituents	State agencies and professional associations	Sources of scarce production factors
Mechanisms of external control	Rules, regulations, inspections	Critical exchange dependencies
Organizational success factor	Conformity to institutional rules and norms	Acquisition and control of critical resources
Dominant threat to autonomy	Government intervention	Resource exchange partners

Figure 6.2 - Task Environment vs Institutional Environment (Adapted from Oliver 1997)

6.1.2 Network Design

Literature on the management of top-down networks is aligned in that networks possess some degree of engineered and non-engineered elements (Dhanaraj and Parkhe, 2006; Doz et al., 2000; Paquin and Howard-Grennville, 2013). There are however, diverging opinions as to which extent the hub firm or network administering organization (NAO) (Provan and Kenis, 2006) can influence the network's design at the time it is created. In his framework for managing and optimizing processes in innovation networks, Eschenbacher and Graser (2011) clearly distinguishes a planning phase, where the network structure and the network competencies are determined. Accordingly, in their conceptual model for orchestrating top-down innovation networks, Dhanaraj and Parkhe (2006, p661) emphasize the importance of a network design phase where *“By its strategic choice of partners, a hub firm can significantly change network membership (size and diversity) and structure (density and autonomy)”*. In their analysis of 101 networks, Olsen et al. (2012) describe the network design as one of the drivers for network success. They describe how the

network manager must choose between a vertical or horizontal network structures, with homogeneous or heterogeneous participants. In their study describing the orchestration processes involved in network-centric innovation, Nambisan and Sawhney (2011) acknowledge the importance of network design elements such as network structure and network embeddedness. Albeit, they explicitly focus on network orchestration processes related to the network operation.

Other research does not focus on network design from a managerial point of view, but instead analyses on how network coordination activities can accommodate a pre-existing network design (Ritala et al., 2009). In this case, the network manager is regarded as an actor that can merely take the network design into account for the purpose of managing the network, but has no ability to affect its design. The network structure is in this way an antecedent for network management. Some studies do not attribute network design directly to network management – at least not in terms of network goal definition – , and focus only on the network processes or operation (e.g. Landesperger et al., 2012). The network manager has the ability to determine the partner structure by selecting the network partners. Albeit, some of the network design aspects, such as network goals, cannot be determined (Gausdal and Mothe, 2012; Gausdal and Nielsen 2010; Landesperger and Spieth, 2011; Landesperger et al, 2012; Laschewski et al., 2002; Gausdal, 2013; Paquin and Howard-Grenville, 2013).

A reason for studies disregarding the possibility of the network manager being fully able to design the network, is that the networks featured in these studies have already had their goals and structures mostly predetermined by government policy (Provan and Lemaire, 2012). Contrastingly, based on the

conceptual framework put forward by Dhanaraj and Parkhe (2006), Léven et al., (2014) perform a longitudinal analysis on a network case since its creation. In this study, they capture interesting network manager activities related to network design where managers identified partners with overlapping goals, and with different competencies along the value system. Subsequent identified network design activities is the design of the network goals. Accordingly, Möller et al. (2005) connect different network outcomes depending if the network has a vertically structured value system, a horizontal one, or a multidimensional value system. This is consistent with empirical research by Olsen et al. (2012).

In the analyzed cases, when probed regarding the network design, network managers focused on two main concepts, namely the network goals and the network partner structure. In terms of network goals, the network could either be more academically or industrially oriented. Academically oriented networks were focused on technology transfer and academically driven collaborative R&D projects. Industrially oriented networks focused on creating new business opportunities, and having industrially driven collaborative R&D projects. These goals could also be more or less specifically defined. For example, the B-Network manager stated that he purposely framed the network goal as unspecific, as simply striving to develop new products and services for the efficient use of biomass. The manager of A-Network on the other hand framed the network very focused on a particular business and technological solution for the IT-sector.

Regarding network structure, either networks could have a very well and complementing partner structure in terms of core-competency and preferred market, or have partners with many overlapping competencies. The manager of F-Network emphasized the importance of ensuring that network partners were

well distributed both horizontally and vertically. B and D Network Managers on the other hand were more interested in creating a critical mass of network partners, and did not place as much emphasis on avoiding partners overlap.

In the framework presented by Dhanarag and Parkhe (2006), where the hub firm is also part of the network, the aspects of network position and power becomes essential for network design. In a NAO however, since the network administration is not a network partner, the question of network position and power does not apply. In the NAO governance model, the NAO is always a central part of the network and, as explained by Popp et al (2014) the end of such networks is normally associated to the dissolution of the NAO itself. In this sense, the power the NAO has over the network is more closely related to aspects of network legitimacy and network partner commitment (Andrésen et al., 2012; Human and Provan, 2000), and not network centrality. For this reason, the aspects of network design regarded for the purpose of this framework are the network goals and the network partner structure.

6.1.3 Network Operation

The most widely used management frameworks for researching innovation networks are the network orchestration framework from Dhanaraj and Parkhe (2006) and the more generally applicable framework by Sydow and Windeler (1998), as presented in Chapter Two. Other studies on managing innovation networks do not use a general framework, but develop models with more specific insights regarding activities in innovation networks. For example, Rampersand et al. (2010) study the impact of communication and coordination activities on network innovation efficiency. Research on innovation networks by Gausdal and colleagues (Gausdal and Nielsen, 2010; Gausal et al., 2011) indicates the

importance trust forming activities such as networking meetings, and activities promoting teamwork and temporary group formation such as R&D workshops. In addition to this, the importance of engaging broadly with community external to the network in order to identify and acquire a large partner base is also referred. In this sense, the network orchestrator must not only develop the network internally among the network partners, but also engage sense-making with the community external to the network (Jolik and Dankbar, 2010; Möller and Rajala, 2007; Still et al., 2014; Olsen et al., 2012). Internally, core activities are on the one hand to manage network projects, to promote communication among network partners and knowledge sharing and to communicate with the network partners. On the other hand, the network manager is expected to market the network externally, and acquire new partners. In the partner acquisition activity, it is most important to clarify Future Expectations and identify the goals.

When analyzing the management of innovation networks, research tends to focus on the dependent variable as innovation output (Dhanaraj and Parkhe, 2006; Levén et al., 2014; Rampersand et al., 2010;). Accordingly, much research on management of innovation networks has adopted the framework by Dhanaraj and Parkhe (2006). This thesis however is aimed at analyzing network commitment and network sustainment instead of the innovation output, which warrants an altered conceptual model. Accordingly, aligned with this study's focus, Human and Provan (2000) focusses on the balance between internal and external network development, and its connection to the commitment of network partners towards network success. The conceptual model from this thesis therefore adopts this designation.

Evidence from the analyzed network cases, also shows the need to balance

internal and external activities. On the one hand, the network manager must promote the network externally and gain new network partners. On the other hand he must also develop the network internally by engaging with the partners, promote networking and knowledge transfer, and develop team projects. In C Network, the network manager develop the network initially, carefully developing the large EAX project, and at a later stage focused more on promoting the network externally. Conversely, the manager from B-Network initially developed the network externally, in external events and via various media channels, and only subsequently aimed at developing the network internally. Therefore, given the discussion above, the activities in the context of the network operation shall be distinguished between internal activities and external activities.

6.1.3.1 Internal Activities

Internal activities performed by the network manager coded in the interviews were: a) engagement with the network partners, b) creating networking activities, and c) developing collaborative projects. Engaging with the network partners consists in creating a dyadic relationship with each network partner, and develop trust and rapport (Abrams, 2003; Gausdal, 2013; Grennvile, 2013; Lefevbre et al., 2013; Provan et al., 2011, Paquin and Howard-Grennvile, 2013). Examples of engaging with the network partners was for instance when B-Network manager expressed the need to get to know the partners personally, and develop rapport with each partners on a one-to-one basis. The manager from F-Network also expressed the importance of having personal conversations with network partners, and getting to know what their personal goals are. He also expressed the importance of assuring the network

partner that aspects discussed between them are private and do not necessarily need to be referred to the other network partners.

Networking activities are important for: information exchange between the partners; to identify possible synergies among network partners; and, to initially develop social mechanisms such as trust between the network partners (Dhanaraj and Parkhe, 2006; Gausdal et al, 2011; Huggins, 2000; Klerkx and Leeuwis, 2009; Olsen et al., 2012; Paquin and Howard-Grennville, 2013; Provan and Lemaire, 2012; Ritala et al, 2012; Savare and Gausdal, 2011). All networks reported the existence of network meetings as part of the process of developing the network. Some managers, as was the case of the C-Manager, emphasized the importance of using these events very much to develop trust and rapport among the network partners, by allowing the network partners to meet the day before in the hotel and have informal encounters. B-Network manager on the other hand, used network meetings not only for networking purposes, but also to introduce network partners to new external entities.

Finally, collaborative project activities consist in bringing partners together with concrete tasks contributing towards a common goal (Dhanaraj and Parkhe, 2006; Doz et al., 2000; Gausdal et al., 2011; Lefevbre et al, 2014; Olsen et al., 2012; Paquin and Howard-Grennville, 2013; Provan and Lemaire, 2012; Ritala et al., 2012). C-Network manager expressed that concrete collaborative problem solving was the best way to ensure goals are met in the network. While some collaborative projects were aimed strictly at performing research and development, others were aimed at generating sales and building revenue. Accordingly, previous research has referred to the difference between R&D and commercialization activities in networks (Katzky et al., 2013; Lee et al., 2010;

Ritala et al., 2012).

6.1.3.2 *External Activities*

External activities identified in the cases were: a) new partner acquisition, b) information gathering, and c) network representation. New partner acquisition is the activity of sourcing new partners into the network, important to bring in new perspectives, information and capabilities (Batternick et al., 2010; Klerkx and Lewis, 2009; Klerkx et al., 2013; Lefevbre et al., 2014; Sydow 2010; Sydow and Windeler, 1998). F-Network manager emphasized the importance to actively seek-out and bring new network partners into the network. New partner acquisition can be performed broadly, as was the case of the B-Network manager in order to increase the number of network partners. On the other hand, as explained by A-Network and G-Network manager, partner acquisition can be performed more selectively. In the case of the referred networks, the activities regarding new partner acquisition were strategically geared towards acquiring new end-users in the network.

Information gathering is the activity of the network manager seeking information that can be interesting to the network partner. As explained by Möller and Rajala (2007), the network manager acts as an intermediary between the network and its environment, thereby keeping the network partners updated with current events. This is consistent with other research (Batternick et al., 2010; Klerkx and Leeuwis, 2009; Klerkx et al., 2013; Olsen et al., 2012). Most network managers expressed that providing the network partners with new information regarding special project calls, and industrial trends was a main activity. This may even occupy most of the network manager's time, as was the case of F-Network. Conversely, the D-Network manager, due to the strategy he

employed to bring the partners in the network – i.e. through concrete projects – did not place as much emphasis on this activity. Finally, network representation consists in advertising the network, its capabilities and services, and thereby increasing its public awareness and legitimacy (Batternick et al., 2010; Human and Provan, 2000; Möller and Rajala, 2007; Ospina and Saz-Carrnça, 2010). Examples of such activities in the cases would be for example when the B-Network manager represented the network partners in conferences, wrote news articles regarding the network, or even when large network events that were open to the public were organized.

6.1.4 Conclusion

The goal of this section was to develop a conceptual model for network management. The final conceptual model is presented in Figure 6.1. Table 6.1 presents a definition for each of the concepts and contains relevant literature for each concept along with some citations from the interviews, where these concepts were coded.

Table 6.1 - Concept Definitions and Coded Examples - Network management framework

	DEFINITION	RELEVANT LITERATURE	EXAMPLES FROM THE CASES
<u>NETWORK CONTEXT</u>	The environment in which the network is created and developed. Can be used to account for contingencies	Cravens et al., 1996; Harland et al., 2004; Ozman, 2009; Koka, 2006; McGuire, 2002; Sousa and Voss, 2008; Salavita et al., 2012	
<u>INSTITUTIONAL ENVIRONMENT</u>	The laws, regulations, monetary incentives, and cultural norms embedded in the network's industrial environment.	Oliver, 1997; Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Zucker, 1987; Scott, 1995)	<p><i>"Well the future of the network, the government has stated that 2000 [wind turbine] units must be built in future. (...) So this is a great potential for us. And we see that the costs are really high in the wind power industry. Also the availability of [online] wind-turbines must be improved upon." – G-Network Manager (1st Interview)</i></p> <p><i>"This theme with the wind turbines...we have concluded that something must be done. It is really a job for policy. (...) They must allow permits to build the offshore wind parks. (...) And the operators they are in doubt if in fact they should build these wind-parks. They do not pay everything from their own pockets; they require investors. And these investors are very uneasy at the moment and holding back. This is why the suppliers are also ver conservative at the moment, because they are not getting any contracts." – G-Network Manager (2nd interview)</i></p> <p><i>"So I had the impression I would already be in the market. (...) But the fact is that these technologies are able to provide the needed technologies, but people are not aware of this. For example, we can do excellent 3D models, but people don't recognize this. (...) There is a problem with the permit for unmanned aerial systems for civilian purposes in Germany and in general in Europe. You do not get flight-approval because it is not exactly ruled by law how these systems can operated." – F-Network Partner</i></p> <p><i>"It's a very important topic on the government's agenda. The worst is if energy prices go up, and the power is not reliable in the future. Its currently very strongly put forward in politics" – E-Network Manager</i></p>
<u>TASK ENVIRONMENT</u>	Resource-based factors affecting the network's industry such as buyer-supplier power, competition, and industry and product/service market structure.	Oliver, 1997a Pfeffer and Salinick, 1978; Wernerfelt, 1984	<i>"The problem is the financial situation in among the firms. Especially with the two largest ones. They had to let people go. Whole departments were closed down, or at least considerably downsized. (...) They are simply not getting any contracts, they let people go, and [company Y] is probably going to die soon. Although they are large companies with a few hundreds of employees, they are in the offshore</i>

			<p>area, and the whole construction there is reduced, (...) and everybody is cutting back. We are having very large problems because of this.” – G-Network Manager</p> <p>“We have a problem with LEDs, in the fact that the main chip suppliers are very large enterprises that are not willing to meet our particular needs. (...) on the other hand the manufactures of special LEDs are very few, and are very specific and not very flexible. And these do not always fit with our applications. This is our greatest concern from the technological side.” – D-Network Partner</p>
<u>NETWORK DESIGN</u>	The initial the network goals and partner structure of the network. This can be the initial stage of the network design, but can also be iterated upon during network development.	Harland et al., 2004; Ozman, 2009; Dhanaraj and Parkhe, 2006; Möller et al., 2005; Nambisan and Sawhney, 2011; Thorgren, 2009; Lében et al., 2014; Carneiro et al., 2012; Ritala et al., 2009; Lefevbre et al., 2014	
NETWORK GOALS	The network goal defines the direction in which the network manager wants to take the network. It is framed with the opportunity and motivations for the creation/development of the network.	McGuire, 2002; Carneiro et al., 2012; Eschenbacher, 2011; Provan and Lemaire, 2012; Olsen et al., 2012; Provan et al., 2011	<p>“A-Network is a network formed from 11 partners, that have the common goal of developing a less costly [product solution], thereby decreasing costs of installation by 30%.” A-Network Manager</p> <p>“The goal of this network is to create a meeting point for companies that have the same view of this theme, and that are willing to put solutions to [smart-grid] problems. (...) To give a chance to smaller companies to participate in large projects. With companies that use old-fashioned components, and experts from the power-electronics area, that want to focus on this theme.” – E-Network Manager</p>
PARTNER STRUCTURE	The Partner Structure describes how the network partners are aligned in terms of competencies and market applications	Carneiro et al., 2012; Nambisan and Sawhney, 2011; Thorgren et al., 2009; Möller et al., 2005; Möller and Svahn, 2007; Dhanarag and Parkhe, 2006; Olsen et al., 2012	<p>“It was important for me to obtain a mixture of partners for R&D, along a vertical value chain from the market applications. (..) Then I also have the different applications, and these are for instance not horizontal across all markets, but they are also focused on special customers. (...) horizontal. This wat I can also organize the different product [ideas] in different horizontal markets. I always use this format. The different markets and the value chain. Then I can also distinguish between the hardware suppliers, the software suppliers and the service providers, and organize my product ideas accordingly. The closer we come to the final customer, the more differentiated are our service and product offers.” – F-Network -Manager</p> <p>“We have lamp-manufacturers, they can do something. We have printer-machine manufactures, as an end-user, which needs this product. We have paint-manufacturers, and we have raw material suppliers (...) And for this to work we must have them around the same table and say, this is where we want to go. This, we can do together.” – D-Network Manager</p>

NETWORK OPERA-TION	The network operation is the combination of all the network activities that occur under the network context, from its creation to its development	Harland et al., 2004; Dhanaraj and Parkhe, 2006; Batternick et al., 2010; Lében et al., 2014; Carneiro et al., 2012; Sydow, 2010; Gausdal et al., 2009; Gausdal and Nielsen, 2010; Ritala et al., 2009; Laschewski et al., 2002; Landesperger et al., 2012; Paquin and Howard-Grennville, 2013; Sydow and Windeler, 1994; Rampersand et al., 2010; Jolikh and Dankbar, 2010
INTERNAL ACTIVITIES	Internal activities describe the network activities occurring and affecting only the network partners and network manager	Humana and Provan, 2000; Huggines, 2000; Olsen et al., 2012; Provan and Lemaire, 2012; Paquin and Howard-Grennville, 2013; Jolink and Dankbar, 2010; Rampersand et al., 2010; Gausdal et al., 2011; Munoz Lu, 2011
PARTNER ENGAGEMENT	Activities focusing on establishing dyadic relationships with network partners, thereby identifying and attending to individual needs, and building trust and rapport.	<p>Paquin and Howard-Grennville, 2013; Gausdal, 2013; Abrams, 2003; Provan et al., 2011; Lefevbre et al., 2013</p> <p><i>The fiscal contact is always very important. (...) I tried to find ways to get to know the people from the network partners personally, and just talk to them and get to know if they have any project ideas, or other ideas we could execute in the network (...) On the other hand I put them my ideas forward. (...) I always try to address the needs of my customer.” –B-Network Manager</i></p> <p><i>“I must understand why the partner is in the network. Does he just want the logo to say he is innovative? Does he want concrete benefits from the network evaluated? The other might want something else...So I try to identify these motivations, and address these advantages. (...) But it is also the soft factors, we need to get to know the person. (...) Then to deliver exactly what he needs. Basically it’s like selling a product. (...) I must take the partner seriously, and engage with his needs. It’s very important the he also realizes the benefits that he takes from the network.</i></p> <p><i>If I do not really know his motivations, then he might sign the network contract in the first phase, but then in three quarters of a year, when I am recruiting for the second phase, I can’t say: ‘Look, this is what you wanted. This is what we achieved. This is where we can work together”- F-Network Manager</i></p>
INTERATION AND COMUNICATION	Activities focused on developing informal connections and exchanging information between the network partners. Through these activities potential synergies and collaboration opportunities are identified, and social mechanisms such as trust and rapport are developed	<p>Olsen et al., 2012; Paquin and Howard-Grennville, 2013; Gausdal et al, 2011; Klerx, 2013; Huggins, 2000; Dhanaraj and Parkhe, 2006; Provan and Lemaire, 2012; Ritala et al, 2012; Savare and Gausdal, 2011</p> <p><i>“I basically use creativity-techniques to bring out the most important themes in the network. I value a lot the inputs from the research-institutes and universities. We discuss themes that are achievable without partners. If they are too large then they are more to be achieved by companies such as Siemens, ABB, or Alstom.” – E-Network Manager</i></p> <p><i>“We meet regularly three to four times per year for network meetings. For more concrete project meetings there is also more preparations. We expect to develop interesting R&D projects that will be interesting for all, and that collaboration starts to emerge between partners. Also, human and social factors are part of this. After time it’s like a social group that is happy to get together from time to time. We meet already in the hotel on the evening before the meetings, and talk about anything. I find this</i></p>

			<p><i>amazing. I find this great, and lots of communication exists that I do not even know of. Not everything happens through me at the moment, and that is good, this is the heart of the network. And I believe they hold these kinds of activities dear, and already get excited regarding the next meeting, where they meet their palls.” – C-Network Manager</i></p> <p><i>“A large problem in our networking sessions is that the partners sometimes do not talk about their real problems. I can understand because I am also a supplier. But, I personally am honest about my problems and do not come across well maybe. I think the idea of competition is holding us back” – D-Network Partner</i></p>
COLLABORATIVE PROJECTS	Collaborative activities between partners and manager concerning concrete tasks to accomplish common goals	Olsen et al., 2012; Provan and Lemaire, 2012; Doz et al., 2000; Paquin and Howard-Grennville, 2013; Gausdal et al., 2011; Dhanaraj and Parkhe, 2006; Ritala et al., 2012; Lefebvre et al, 2014	
R&D PROJECTS	Collaborative project activities aimed at accomplishing research and development goals	Doz et al., 2000; Brenner et al., 2013; Noteboom, 2002; Dhanaraj and Parkhe, 2006	<p><i>“It is only because of the very different partners and competencies that we can perform the required research and development for such complex projects. Normally such projects can only be accomplished by tier 1’s. These are companies with around many thousand workers, with high organizational and technical ability. (...) We can bring our small companies together, we are all very happy about this” – C-Network Manager</i></p> <p><i>“We initially had thought to build things from infrared LEDs instead of UV-LEDs. We then found one partner from Berlin that had these LEDs, but these were not to specification. (...) So we had to change the R&D project in order to accommodate these new LEDs. (...) It was’nt just like pressing a button, it was a very iterative process. But we all said what we could do and what we wanted, and in the end we identified an innovative solution for the project” – D-Network Partner</i></p>
COMMERCIALIZATION PROJECTS	Collaborative project activities aimed at accomplishing common sales as end-goal	Ritala et al., 2012; Human and Provan, 2000; Katzy et al., 2013; Lee et al., 2010	<p><i>“For [the large automotive manufacturers], we are borderline exotic. For other companies we bring hope on the horizon. [With this project] we can give this truck-manufacturer the possibility to sell 2-3 thousand units, because he is at the moment dependent on suppliers that don’t want him to be the first and only one in the electric lorry industry. So we are good hope for them. (...) They give us tipsps, and say ‘If you were to build it that wat, we will buy it!’ There is nothing formally written, buts that’s how I know this business. The conversations we are having are very positive” – C-Network Manager</i></p> <p><i>“We joined this network to sell new products. Our goal was held high, and we have arrived at that point. The company [partner X] is in touch with us and we are trying to deliver our products together at lower costs. The only way to reduce costs is to work together. (...) this was possible through the network, and now we are trying to sell. (...) We thought what the best way would be to bring this to the market,</i></p>

			<i>and the best way was as a joint venture(...) This way we can jointly govern manage this project” – A-Network Partner</i>
EXTERNAL ACTIVITIES	External activities describe the network activities occurring between the network actors and external entities	Human and Provan, 2000; Rajala, 2007; Still et al, 2014; Olsen et al., 2012; Möller and Rajala, 2007; Provan and Lemaire, 2012	
NEW PARTNER ACQUISITION	Activities related to contacting external actors and acquiring them as new partners in the network	Klerkx et al., 2013; Sydow 2010; Sydow and Windeler, 1994; Klerkx and Lewis, 2009; Batternick et al., 2010; Wubben et al., 2010; Lefevbre et al., 2013	<p><i>“I did everything possible to try to (...) build the network. I went to conferences that had to do with biomass, and tried to establish direct contact with potential network partners. I tried to go through recommendations, by telling people what I do...Internal and externally to my personal contact field. I also used google to find new partners active in this area (...). I also looked for partners using social media like Facebook. (...) I talked to around 250 potential partners.” B-Network Manager</i></p> <p><i>“It’s important for me to be up to date with the area of this network. Then when I go to meet potential partners, I must have a varied bouquet of services I can offer them when they become network partners. Hopefully, they will feel that two or three of them are interesting for them. (...) It’s just like in making sales. I try to identify quickly what kind of a person he is, and offer services that may be interesting for him.” F-Network Manager</i></p>
NEW INFORMATION ACQUISITION	Activities regarding identifying information relevant to the network, and providing this information to the network partners	Olsen et al., 2012; Klerkx and Lewis, 2009; Klerk et al., 2013; Baternick et al., 2010; Möller and Rajala, 2007	<p><i>“One is Always informed of what is going on...(…) I just do my job, and don’t think much about it. [The Network Manager] informs me when there will be special programs or events. It’s great!” - B-Network Partner</i></p> <p><i>“We get information from different consortiums. We have new information from energy suppliers for instance. We get new ideas of things to do. Also information from potential customers and new information in general regarding this theme.” - E-Network Partner</i></p>

EXTERNAL REPRESENTATION	<p>Activities related to presenting and disseminating the network along with its goals, partners, products and services to actors external to the network.</p>	<p>Human and Provan, 2000; Möller and Rajala, 2007; Batternick et al., 2010; Ospina and Saz-Carrnça, 2010</p>	<p><i>"[Additionally to being a network manager], I am also part of a consulting company, where we do technology and strategy. With this experience and the contacts I acquire, I can represent my network partners, providing them with higher visibility." – A-Network Manager</i></p> <p><i>"A third point that interests the network partners is the representation and recognition they get through the network. With these projects, we gained some notoriety in the political spheres, which have great influence on the companies. This was registered as a very positive effect...That we appear on some fancy brochures with our network logo at some super events. These companies that were once just sitting in a corner, would not have been able to achieve this on their own. But our network is everywhere, and I can get the partners in special events or meetings, or presentations at Volkswagen. I always carry with me any partners that are interested. We were recently invited by Daimler, and discussed regarding future projects together. Such an opportunity would never be available to an SME on its own." – C-Network Manager</i></p> <p><i>"I do much public relations work for this network. I write newspaper articles, to explain what the network is doing, and to let people know that a network like this even exists. (...) I do these activities in the press, and in online articles. (...) even Facebook and LinkedIn"</i> B-Network Manager</p>
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6.2 Data Analysis

The data from the cases (presented in Chapter Four) was analyzed initially based on open coding (Charmaz, 2006; Corbin and Strauss, 2007) and extensive memoing (Corbin and Stauss, 2007), allowing for close interaction with the data. Through this process, lower-level codes were combined and re-arranged into second order codes. Finally, conceptual mapping with CMap software (Appendix V) assisted in the extraction of higher-level categories. Finally, the codes were compared and conceptually aligned with the literature. The resulting emerged categories and concepts were presented as the conceptual framework in the previous section. Table 6.2 presents the frequency code count for each of the analyzed networks.

It is possible to observe that in total, the frequency of the context codes are relatively smaller than the frequency count of the design and operation codes. This has to do with the units of analysis employed for this case study. The case study design accounts for the unit of analysis at the network level and at the partner level. The data gathering procedures therefore naturally uncovered more information regarding how network commitment was influenced by the network operation and network design. Albeit, the amount of data describing the network context is still considerable, and is therefore included in the network case description. A large source of information regarding the network context was the network manager interviews and the official network reports sent by the network managers to the BMWi.

Codes related to network operation are also 50% higher than codes related to network design. This is mainly because some networks partners focused more on network activities in their accounts regarding the network. Network

managers, on the other hand mentioned network structure and network goals as well as the network activities performed in the context of the network. The code count is consistently distributed among all network cases, albeit with some cases having a greater amount of codes in certain categories. This was sometimes due to a particular important category in the network accounts. For instance in G-Network there is a relatively higher count of Network Context codes. This is expected since a main critical issue in this network case was that changes in the institutional environment generated a ripple effect throughout the entire industry and network. Contrastingly, in the Network Operation category code count is highest for F-Network and for C-Network. This is also consistent with accounts from the case studies, in the sense that these network managers placed much importance in developing the network activities. Categories of Network Context and Network Design are evenly distributed among the underlying concepts. On the other hand, in the Network Operation category Internal Activities have more than double the amount of codes than External Activities.

Table 6.2 – Code Frequency Matrix – Management Concepts

Network	A	B	C	D	E	F	G	TOTAL
<u>Context</u>	11	12	15	8	19	16	27	108
Institution	2	8	8	7	7	8	10	50
Task	9	4	7	1	12	8	17	58
<u>Design</u>	32	25	57	45	46	47	36	288
Goals	14	19	24	15	28	15	18	133
Structure	18	6	33	30	18	32	18	155
<u>Operation</u>	64	71	82	48	37	90	43	435
Internal Activities	50	36	63	36	33	51	34	303
<i>Partner Engagement</i>	8	10	7	6	2	19	2	54
<i>Internal Interaction and Communication</i>	9	13	19	13	17	16	14	101
<i>Commercialization Development</i>	20	1	8	0	1	5	1	36
External Activities	14	35	19	12	4	39	9	132

<i>New Partner Acquisition</i>	5	17	9	6	1	17	4	59
<i>New Information Acquisition</i>	2	11	4	6	3	6	2	34
<i>Network Representation</i>	7	7	6	0	2	16	3	41
<i>R&D Development</i>	13	12	29	17	13	11	17	112
Total	107	108	154	101	104	153	106	833

Given the fact that the analyzed cases are innovation networks, with the main purpose of creating new products and services, it is expected to find more information regarding Internal Activities than External Activities. In line with what was expected from the case studies, A-Network has the higher number of codes in terms of Commercialization Development and both B-Network and F-Network have a higher number of codes in New Partner Acquisition. The high number of codes in these two networks in the Partner Engagement concept is also in line with the fact that these network managers stressed the importance of establishing a personal relationship with the network partners. Finally, the relatively higher code count of the New Information Acquisition concept in B-Network is consistent with reports from the B-Network case where both partners and the manager explained that the acquisition of new information in the network was one of the main advantages of this network. Although, simply counting code frequencies does not provide great insights into the details of the data, it is a suitable way to help identify what the main themes in the cases are. This information albeit, is only of use when combined with detailed accounts from the case studies as can be observed in the cross-case analysis on Table 6.3.

Table 6.3 - Cross Case Display – Management Concepts

	Context		Design		Operation					
	Institutional	Task	Goals	Structure	External Activities			Internal Activities		
					Acquisition	New Information Acquisition	Representation	Engagement Activities	Networking and Communication	Commercialization Development R&D Development
A-Network	-Political differences between Austria and Germany make it harder to coordinate government sponsored projects	-Commercial need for a cheaper Fiber-optic installation projects	-Build a new fiber-optic network infrastructure	-Highly complementing network partners - Partners are already used to working together -Partners have good 'chemistry'	-Partners carefully selected and acquired via pre-existing ties -Focus on end-users	-Information from network manager, due to consulting activities -Information of market from end-users (service providers)	-Representation of partners by network manager during consulting activities -Common representation as joint firm (Later Stage)	-Network partners have a personal relationship with the network manager -Frequent conversations and goal alignment before network officially began	-Very frequent network meetings with all the network partners -Discussing where to go as a team -Good amount of focus on concrete projects	-R&D activities are used on a smaller scale -Main focus are commercialization activities -Hard to balance both R&D and commercialization activities
B-Network	-High political interest in the area of sustainable biomass usage	-'Curious' partners from the area are interested in developing technological resources in the area -Many research institutes want access to firms	-Allow for technology transfer and R&D in efficient use of biomass	-No large concern with initial structure, partners acquired if interested in the network goal	-Manager did 'everything he could' to get partners into the network. From personal contacts, to going to conferences, including getting into contact with previously unknown partners over internet	-Large focus on providing 'very interesting' presentations from experts from the area -Recurrently inviting external partners to meetings to provide new inputs	-Publicizing the network as a whole in terms of the network goals in magazines and in social media -Representing the network partners and services at conferences (Later Stage)	-Personal and face to face contact highly valued, to build rapport and develop trust	-Networking used more to get to know one another -Networking used to create collaborative projects (At a later stage) -Project meetings when needed -Workgroups to focus more closely on different issues	-At a later stage in the network concrete projects start to emerge in the network -Emphasis on technology transfer -Not much emphasis on commercialization activities

C-Network	<ul style="list-style-type: none"> -The electric mobility area is of high interest for German Government and for the public - At a later stage, public interest diminishes 	<ul style="list-style-type: none"> -Companies in the automotive industry have the need and are used to combining different competencies and resources to develop large projects 	<ul style="list-style-type: none"> -Develop a concrete large project for the truck manufacturing industry -Develop later other smaller projects focused on electric mobility 	<ul style="list-style-type: none"> -Vertically structured network with partners complementing each other's competencies well, together with some research institutes -Most partners from automotive industry, others with competencies in power-electronics 	<ul style="list-style-type: none"> -Partner acquisition made mostly based on previously existing ties 	<ul style="list-style-type: none"> -Focus on information from project calls from network manager - Information regarding state-of-the-art from manager and new partners 	<ul style="list-style-type: none"> -Network gained notoriety through successful large project development and coordination -Network manager brings network partners wherever he goes 	<ul style="list-style-type: none"> -Engage with partners through personal relationship - Emphasis on finding out what partners want -Gain partners trust and convince them to participate in the network 	<ul style="list-style-type: none"> - Promote social networks, information exchange and friendship between the network partners - Often meetings 3-4 times per year, plus additional project meetings -Workgroups to focus more closely on different issues 	<ul style="list-style-type: none"> -Many R&D projects both small and large -Commercialization projects foreseen after large R&D project is completed -Some partners established business among each other
D-Network	<ul style="list-style-type: none"> -Requirements for gaining government sponsorship in projects is hard to achieve since LED manufacturers are outside Germany 	<ul style="list-style-type: none"> -Large LED manufacturers are not interested in working with network partners because ordered quantities are small -Specialized LED manufacturers are too specific and sometimes no flexible enough for collaboration 	<ul style="list-style-type: none"> -Focused on a concrete project with identified customer to begin with (UV-light LEDs only) -Later goal pivoted towards acquiring large partner base with concrete collaborative R&D projects (ALL light spectrum LEDs) 	<ul style="list-style-type: none"> -Initially very specific vertical partner structure, geared towards a concrete project with identified end-user -Later, reduced focus on guaranteeing a complete value system with no competition 	<ul style="list-style-type: none"> -Initially the partners are acquired based on the rational of a concrete value system and network project - Later network partners are aggressively brought into the network in exchange for concrete R&D projects 	<ul style="list-style-type: none"> -Not much focus given on external information acquisition -Only targeted information regarding specific project funding programs 	<ul style="list-style-type: none"> -No activities reported regarding providing external representation for network partners, with exception of logo and web-site development 	<ul style="list-style-type: none"> -Engaging with network partners to develop concrete projects -As part of the network strategy, network partners are engaged with prior to entering the network 	<ul style="list-style-type: none"> -In line with initial network goal, networking among network partners was foreseen -In line with the pivoted network goals however low emphasis was put on networking, information exchange and developing social relationships 	<ul style="list-style-type: none"> -Initially network was created with emphasis on R&D and commercialization activities -Later focus given on R&D projects

E-Network	<ul style="list-style-type: none"> -The area of smart grids and renewable energies in an important topic in both political and public opinion -Later, according to some statements from partners the theme has lost a bit of interest 	<ul style="list-style-type: none"> -Current grid resources are operating close to their limits, and there is a need to modernize -Old fashioned grid operators are not interested in upgrading their systems of engaging in R&D activities 	<ul style="list-style-type: none"> -Bring SMEs and research institutes together that are interested in developing new products and services potentially needed for smart-grid operation 	<ul style="list-style-type: none"> -A mix of energy providers, and companies already supplying products and services for the grid, and additionally some companies and research institutes with competencies in power-electronics, GIS and net simulation 	<ul style="list-style-type: none"> -Acquisition through personal contacts and through new contacts - Not many accounts of acquisition provided 	<ul style="list-style-type: none"> -Network manager makes effort to keep partners informed of what is going on in the area -In the end, one of the partners main motivation to stay in network is access to new information 	<ul style="list-style-type: none"> -One of the goals of the sustained network is to influence public policy by jointly developing studies regarding the area 	<ul style="list-style-type: none"> -The network manager engages with the network partners as part of everyday activities 	<ul style="list-style-type: none"> -Networking and information exchange between partners is one of the most important aspects of the network - Workgroups are employed -Some workgroups are terminated due to low interest from partners 	<ul style="list-style-type: none"> -Networking activities give rise to R&D projects -No accounts of commercialization activities
F-Network	<ul style="list-style-type: none"> -Legislation to direct UAS for civilian purposes is still lacking -Public awareness of UASs for is low 	<ul style="list-style-type: none"> -Many new market applications in which UASs can be applied 	<ul style="list-style-type: none"> -Broad goal of providing a common place for companies and research institutes active with UAVs to exchange information and raise awareness of the emerging possibilities with UAVs 	<ul style="list-style-type: none"> -Distribute network partners both vertically along a value system, and horizontally among different market applications -Emphasis on establishing good complementarities and low competition 	<ul style="list-style-type: none"> -Many partners acquired through old connections -Acquiring new network partners is like 'in sales' -Allow potential partners to stay informed of what is going on in the network, maintaining the relationship 	<ul style="list-style-type: none"> -Network manager brings information regarding industrial and political developments to the network partners -Manager participates in fairs and conferences to other information 	<ul style="list-style-type: none"> - Manager represents the network as a whole at conferences and political institutions -Manager also represents individual partner's product and service offerings at fairs when requested 	<ul style="list-style-type: none"> -Emphasis given on establishing a personal dyadic relationship with network partners to establish trust, and determine individual needs -Emphasis on catering specifically to partners individual needs, and repeatedly identifying individual accomplished goals 	<ul style="list-style-type: none"> -Networking to establish trust among the network, and exchange ideas and experiences -Openly talk about network partners priorities and competencies and applications to establish trust 	<ul style="list-style-type: none"> -Many R&D projects are developed in the network -Contact is established with potential customers, or applicators in order to determine if a UAS-based service can be provided

G-Network	<p>-Initially very favorable political framework. Government states that 2000 wind turbines are to be installed on offshore wind parks</p> <p>-Later government rolled back on initial plan, creating uncertainty among investors</p>	<p>-Incumbents possess high sunk costs in existing technologies, and do not want to invest in R&D – Because of uncertainty incumbents are reluctant to disclose technological problems</p> <p>-Already many existing networks in this area, results in direct network competition</p>	<p>-Goal was to develop new cost-saving technologies for wind-mill development and maintenance</p>	<p>-Some network partners are mostly small players from the wind-energy industry, but most are new entrants</p> <p>-End-users are reluctant to enter the network because of cost-reduction programs</p>	<p>-Some partners acquired through personal connections</p> <p>- Network manager is focused on acquiring end-users or insurers to endorse R&D activities in maintenance technologies</p>	<p>-Network manager provides partners with information regarding the industry, since most partners are newcomers</p>	<p>-Network manager represents the network partners in fairs when possible</p>	<p>-Due to complications in the industry and ripple effects on the network, manager does not have much time to engage with all partners on a personal level</p>	<p>-Networking activates are consistently held, to discuss new topics and share information, however network partners are increasingly uninterested in attending the meetings</p>	<p>-Focus on R&D projects</p> <p>-Many projects thought-out by network management, but due to the unfavorable network context, and subsequently in the network partner structure only one project has been successfully initiated</p>
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Concept Summary	<p>Dimensions:-Can have high or low public awareness</p> <p>-Can have favorable or unfavorable government legislation</p> <p>-Can have favorable or unfavorable government incentives</p>	<p>Dimensions:</p> <p>-Can have favorable or unfavorable commercial opportunities for the network</p> <p>-Can have favorable or unfavorable industry structures</p> <p>-Can have high or low competition from other networks</p>	<p>Dimensions:</p> <p>-Can be narrowly or broadly defined</p> <p>-Can be scientifically or commercially oriented</p>	<p>Dimensions:</p> <p>-Can be focused on specific required competencies</p> <p>-Can be focused on developing a well distributed structure of complementary partners with no competitors</p> <p>-Can be focused on acquiring as greater number of partners as possible, not focusing on completing or overlapping competencies</p>	<p>Dimensions:</p> <p>-Can be emphasized at the beginning of the network or emphasized throughout entire network lifecycle</p> <p>-Can be focused on a particular type of partner (ex.: End-Users, firms, research institutes) or on any partner type</p> <hr/> <p>Examples of such activities:</p> <p>-Acquiring through existing personal contacts</p> <p>-Searching for new partners online</p> <p>-Acquiring at conferences and fairs</p> <p>-Acquiring through existing network partners</p>	<p>Dimensions:</p> <p>-Can have emphasis on new technologies, market status, legislation and project calls</p> <p>-Can be general on the network theme or particular to a certain goal</p> <hr/> <p>Examples of such activities:</p> <p>-Network manager acquires information from parallel business activities</p> <p>-Network manager going to conferences and fairs and reporting to network managers</p> <p>-Inviting experts to present new information at meetings</p> <p>-Inviting new organizations to present at meetings</p>	<p>Dimensions:</p> <p>-Can have strong or weak emphasis on PR</p> <p>-Can represent network as a whole and/or individual network partner products and services</p> <hr/> <p>Examples of such activities:</p> <p>-Going to conferences and fairs</p> <p>-Talking to potential customers</p> <p>-Representing network in parallel activities</p>	<p>Dimensions:</p> <p>-Can be to develop rapport and trust and/or to assess partner needs</p> <p>-Can be performed when acquiring the partner, on once partner has entered the network</p> <hr/> <p>Examples of such activities:</p> <p>-Contacting the partner in person</p> <p>-Contacting the partner remotely</p>	<p>Dimensions:</p> <p>-Can be used to establish personal connections and/or exchange information and/or to get to know partner competencies and/or to develop concrete projects</p> <p>-Can be organized by network manager or by network partners</p> <hr/> <p>Examples of such activities:</p> <p>-Meetings at the network partners locations</p> <p>-More focused Workgroup meetings</p> <p>-Meetings at large venues</p>	<p>Dimensions:</p> <p>-Can be focused on commercialization or focus on R&D</p> <p>-Can be focused on a specific potential customer, or on an emerging market in general</p> <hr/> <p>Examples of such activities:</p> <p>-Develop projects based on identified opportunities</p> <p>-Develop projects based on concepts created collaboratively in meetings</p> <p>-Develop projects put forward solely by network manager</p> <p>-Develop projects put forward solely by a network partner</p>
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Apart from providing an overview of all the network cases, Table 6.3 provides insights into emerging patterns among the different core concepts. These patterns are addressed in detail in the following sections of this chapter.

The next section will focus on the connection between different management practices and the impact on the network commitment drivers. In order to assist with this analysis the Table 6.4 provides a co-occurrence matrix. A co-occurrence is considered when two different codes are contained in the same paragraph of the analyzed data. For example, if the code ‘Future Value’ and ‘Context\Institution’ are coded within the same paragraph, this will increment the co-occurrence value by 1. In this case in particular, these concepts were coded within the same paragraphs 16 times.

While a somewhat crude form of analysis, this form of aggregated data display can assist with the identification of commonly occurring patterns in the data, and help uncover relationships between different concepts (Arora and Stoner, 2009; Guest and Mclellan, 2003). While this is a useful tool for uncovering relationships in the data, it is no substitute for rich case descriptions and is therefore used together with accounts from the analyzed cases.

Table 6.4 - Co-occurrence Matrix. Developed with MaxQDA (Within same paragraph co-occurrence)

	Present Value	Social Mechanisms	Future Expectations
<u>Context</u>	36	4	25
Institution	16	2	14
Task	20	2	11
<u>Design</u>	76	76	38
Goals	38	24	23
Structure	38	52	15
<u>Operation</u>	153	166	105
External Activities	65	54	32

<i>New Partner Acquisition</i>	33	39	8
<i>New Information Acquisition</i>	14	11	4
<i>Network Representation</i>	18	4	20
Internal Activities	88	112	73
<i>Partner Engagement</i>	16	22	22
<i>Interaction and Communication</i>	25	48	21
<i>Commercialization Development</i>	24	4	10
<i>R&D Development</i>	30	38	28

6.3 Findings

The following sections will develop propositions based on accounts from the case studies concerning how the concepts from the conceptual model (Figure 6.1) affected the network commitment drivers (Figure 5.1).

6.3.1 Network Context

The network context, as explained in the previous section defines the environment in which the network is created and subsequently developed. Referring to the summary section of Table 6.3 it is possible to observe how the network context can vary considerably in the different network cases, unavoidably affecting the outcome of the network.

The institutional environment constituted for most networks, at least at network begin a positive factor for network creation. At the time of creation, for instance B-Network, C-Network, E-Network and G-Network counted with favorable policy incentives for new R&D projects, along with a favorable political agenda. G-Network for example, was initially positively affected by the political agenda, in the way that government stated that large investments needed to be made in the offshore wind-parks. Later, however the network government policy

rolled back on these statements, generating ripple effects throughout the industry eventually negatively affecting the network. In B-Network, C-Network and E-Network government interest in these areas also diminished, although to a smaller extent. The fact that government was no longer as interested in supporting these technological areas as emerging technologies made the networks become less interesting from the partners' perspective. Because it was harder to acquire a government-funded project the Present Value diminished for the partners. Moreover, these statements decreased the expectations of the network partners, in regards to a well functioning network. A good example of this is for instance in C-Network when network partners became disappointed, because it seems the electric vehicle market will not develop as expected. In networks created around themes that have high political importance, there seems to be a decrease in Present Value and Future Expectations when there is a decrease in political interest over time. A contrasting case is F-Network, when at network begin there was low importance given by policy to UASs technologies. In this network the low importance of the network theme for policy did not affect partner motivations in the network. In fact, a goal of this network was to create awareness for the important possibilities obtainable with UASs. It is therefore arguable that if political interest in UASs increased, partners would be more interested in the network. This leads to the following proposition.

E.1: Positive or negative in the institutional environment are respectively positively or negatively related to present value and future expectations.

The task environment relates to resource-based factors affecting the network's industry such as buyer-supplier power, competition, and industry and product/service market structure. In the network cases, especially for the most

SME-oriented networks, the task environment influenced major project opportunities for the network. Examples of this are the commercial need for cheaper fiber-optic installation projects in A-Network, the need for the modernization of the grid in E-network, the truck manufacturer who was willing to purchase the fully developed project from C-Network, the various market applications possible with UASs technologies, and the manufacturer who was interested in jointly developing a UV-Printer in D-network. The task environment was reportedly stable in regards to the network. Albeit, for some networks, changes in the task environment had a negative impact on the network: a decrease in interest from the truck manufacturer triggered a modest decrease in motivation in C-Network; and problems with the UV-Printer forced a pivoting in network strategy in D-Network. Problems regarding the dimension of suppliers in D-Network also made it harder to bring partners together. Finally, the cost-saving behavior from the industry in G-Network decreased the value of the network, and the expectations that the network would develop positively in future. The following proposition is therefore derived.

E.2: A task environment with concrete opportunities is positively related to Present Value and partners' future expectations.

Finally, it is important to refer that in the cases, concrete business goals in examples such as the A-Network and C-Network are closely associated with the task environment. Statements from policy regarding an emerging technology or theme, such as the biomass energy technologies from B-network and the smart grid technologies from E-Network, or even the future of electric cars in C-Network are more closely connected to a future vision of the network. Thus, the following proposition is presented:

E.3 Changes in the institutional environment have a larger impact on future expectations, while changes in the task environment have a larger impact on Present Value.

The co-occurrence matrix in Table 6.4 supports the developed propositions. Co-occurrences on Present Value and partner expectations are considerably higher than for Social Mechanisms. Additionally, for Present Value the task environment has a higher score of 20 compared to the score of 16 of the institutional environment. Conversely, regarding partner expectations the institutional environment (14) has a greater score than the task environment (11).

6.3.2 Network Design

The network design includes the determination of the network goals and the choice of network partner structure. Although both the structure and the network goals can be changed over time, the initial network design sets out the framework under which the network will be operated. In the analyzed case studies, the network goals could be narrowly defined on a concrete problem, as was the case of A-Network and D-Network at network begin, or could be defined broadly, as was the case of B-network and E-Network. Other networks lie somewhat in the middle (F-Network, G-Network), or even contain some very concrete defined goals along with some more high level ones. This was the case of C-Network with the concrete EAX project, but then also with smaller projects related to the electric vehicle theme. Networks with more concrete goals also seemed to be more SME-oriented than broader networks. According to the cases, SME-oriented networks with concrete goals allowed for the partners' business goals to be better aligned to the network goals and thus had higher Present Value. We thus arrive at the following proposition.

F1: Concrete business-driven network goals are positively related to present value.

When designing their networks, different approaches were used by the network managers. The managers from A-Network, C-Network and initially D-Network were very particular regarding the types of network partners they wanted to include in their network. These managers selected a mostly vertical network structure with the partners needed to accomplish their focused network goals. Managers from these three networks emphasized the importance of guaranteeing that the network partners complemented each other well. Contrastingly, B-Network manager used a different approach by allowing many partners to join the network regardless of their core competency. B-Network was thus structured both horizontally and vertically (Möller et al., 2007), with overlapping competencies. As seen in section 5, competency overlapping leads to competition and decrease in trust. This problem was also observed in D-Network when the network manager broadened the network goal, and focused on enlarging the partner base. The manager from F-Network expresses high sensitivity to avoid direct competition among network partners. Although at network begin he did not have concrete network projects, he emphasized the importance of distributing the partners carefully, in order to avoid overlapping of competencies and conflicting goals. Thus, this brings us to the proposition:

F2: Non-overlapping of network partners competencies and non-conflicting goals is positively related to strong Social Mechanisms.

Additionally to the impact on Social Mechanisms, the network structure can also affect the Present Value through the inclusion of end-users in the vertical network structure. As explained by the A-Network manager, end-users provide

inputs from the market and in some cases can constitute customers for some network partners. This increases the chance of everyday business occurring in the network and therefore increases the value of the network for the partners. Networks in which end-users were harder to bring into the network such as G-Network, or where the end-users are not very interested in performing collaborative R&D such as E-Network, additionally illustrate the fact that contemplating the existence of end-users when designing the network structure is of great importance to increase the Present Value.

F3: The existence of end-users in the network structure is positively related to Present Value.

The data from the co-occurrence matrix (Table 6.4) is mostly consistent with the data from the cases. The highest score regarding the network structure code is with Social Mechanisms, which would account for proposition F3. The second highest score accounts for propositions F2. Regarding the network goals code the highest of co-occurrence is with Present Value, which is consistent with proposition F1. Also, the high values in Social Mechanisms and partner expectations, suggest that there is a connection between these two drivers and the design of the network goal. For instance, the goal of A-Network was to jointly develop a concrete service and later form a company. This goal statement allures to the need for partners to develop Social Mechanisms by cooperating, and promises a vision for the future of the network, which was connected in section 5 to partner expectations.

6.3.3 Network Operation

The network operation describes the everyday activities performed in the network by the network manager and network partners. In terms of internal

activities all network managers mentioned Partner Engagement, Networking and Communication, and Collaborative Projects. This section will elaborate on how these activities affected network commitment in the network, according to the analyzed cases.

The activities regarding Partner Engagement were differently employed among the network managers. B-Network and F-Network managers for instance emphasized the importance of continuously developing trust and rapport with the network partner and getting to know his personal motivations. Other managers such as D-Network emphasized more the importance of engaging with the partner when acquiring the network partner. Other networks such as A-Network and C-Network emphasized the importance of working with partners with whom there is already a previous working relationship, and thus making it easier to establish higher levels of trust and rapport.

G1 – Engaging with the network partner is positively related to Social Mechanisms, namely increased dyadic trust between network managers and partners

Partner Engagement activities do not only allow for establishing trust. According to accounts from the F-Network and the C-Network manager, it is in engaging with the network partner that one can address the partners' future goals and expectations in the network. The following proposition therefore can be derived:

G2 – Engaging with the network partner is positively related to future expectations.

Interaction and communication is one of the most crucial activities in an innovation network (Dhanaraj and Parkhe, 2006; Gausdal et al., 2013; Paquin and Howard-Grennville, 2013). This activity provides an opportunity for network

partners to identify of common interests and complementarities and develop collaborative projects through the (Paquin and Howard-Grennville, 2013). Most of the managers from the analyzed cases (A-Network, B-Network, C-Network, E-Network, F-Network and G-Network) emphasized the importance of using network meetings or developing workgroups to allow the partners to communicate their interests to each other, identify potential synergies and start to develop trust between each other. The following proposition is therefore derived:

G3 – Initial Interaction and Communication is positively related to the development of Social Mechanisms, namely trust.

To engage in collaborative innovation projects is the main goal of innovation networks in general (Batternick et al., 2010; Dhanarag and Parkhe, 2006; Rampersand et al., 2010), which was also the case in the analyzed networks. As reported by network managers and interviewed partners, the activities that most motivated the partners in the networks were the development of collaborative projects. For this reason, the existence of new collaborative projects in the network is very closely connected to the value of the network. As reported by the C-Network manager and from accounts from B-Network, the failure to bring the network partners into concrete network projects will result in a much lower network commitment. In fact, according to Olsen et al. (2012) concrete problem solving is positively related to motivated network partners. We therefore arrive at the following proposition:

G4 – The existence of collaborative projects is positively related to present value.

An important account from A-Network manager also observed in the other

networks, was that the perception of the Present Value differs, depending on the network partner type. Concretely, for SMEs, a network will have more value if the projects are more closely related to their everyday business goals. As such, they will be more interested in projects that have the immediate goal of increasing their business, namely through the development commercialization projects. Contrastingly, R&D projects will have a more long-term effect on business, which can be comparatively less desirable in regards to commercialization projects, especially in regards to SMEs. On the other hand, research institutes prefer R&D projects and therefore these projects will increase the Present Value for them. In his comments, A-Network manager noticed the need to balance the needs of different network partners. This can be especially critical when balancing SME's and research institute's needs (Faems et al., 2008; Lefebvre et al., 2014; Saguy, 2011) We thus arrive at the following proposition:

G5 – R&D projects are more positively related to present value for research institutes while commercialization projects are more positively related to present value for SMEs

Finally, in the network cases, collaborative projects did not just serve to satisfy the interests of the network partners, and achieved the network goals. Through working together closely, these activities promoted an increase of trust. In fact, regarding the building of trust, network partners repeatedly stated that networking events and exchange of information was in fact important to build trust initially. This was especially important when there were no pre-existing ties in the network. Albeit, the best reported way in which to build trust was when working together in concrete projects. The finding that concrete collaboration strengthens partner trust is consistent with previous literature (Brenner et al.,

2013; Meyerson et al., 1996; Nooteboom, 1999). The following propositions is therefore derived:

G6 – Collaborative projects are positively related to Social Mechanisms, namely the building of trust.

Interestingly, the propositions derived regarding Internal Activities are consistent with values from the co-occurrence matrix. Consistent with propositions G1 and G2, both Social Mechanisms and Partner Expectations seem connected with Partner Engagement. Proposition G3, is very well represented in the co-occurrence matrix. Specifically, the code Networking and Communication are much stronger related to Social Mechanisms (48) than Present Value (25) and Partner Expectations (21). In terms of Collaborative Projects, it is possible to verify that Present Value has the strongest co-occurrence (54), and Social Mechanisms has the second largest (42). This corroborates propositions G4 and G6.

External activities were less frequent than internal activities, as can be seen in Table 6.2. Concerning New Partner Acquisition activities, according to accounts from network partners, the influx of new partners into the network has the possibility of increasing the number of competencies and themes to work on. Using the terms expressed by network partners, new partners bring ‘fresh blood’ into the network, and prevent it from ‘drying out’. In fact, maintaining a critical mass of partners in a network has been shown important for network success (Wincent et al., 2012). Furthermore, it has been shown in previous literature that balancing existing and new partners in a network is important for network success (Klerx and Aarts 2013). By bringing in new partners that can bridge structural holes, new information can be made available for the network partners

(Ahuja, 2000; Bell and Zaheer, 2007). Finally, as described in Chapter Five novelty in the network is positively related to Present Value. This delivers the following proposition:

G7-New Partner Acquisition is positively related to present value.

For the same reason, activities related to New Information Acquisition is also expected to be connected to increased Present Value. In some of the analyzed networks the fact that, through the network, the network partners would be kept up to date with information on the market, technology or special incentive programs, was one of the main motivators for joining the networks. This was specially the case of B-Network during its emergence and most of its development. In addition, in part, for E-Network, one of the reasons that made the partners interested enough to continue in the network, was their access to new information through in the network meetings. The following propositions are therefore derived:

G8-New Information Acquisition is positively related to present value.

Since this work focuses on networks, which are more focused on developing new products and services, the accounts of External Representation activities were relatively less in comparison to other network activities. Furthermore, when prompted regarding their main goals in entering the networks, network partners mentioned as priorities entering in new projects, getting to know new partners, developing business and gathering new information. Being represented by the network was thus most of the times not among the main reasons for joining the network. However, accounts from network managers suggest that on the one hand network partners did enjoy being part of a network with some degree of external notoriety. In fact, as explained by the B-Network and F-Network

managers even in later network stages network partners requested that the network manager represent them in external conferences and fairs. Examples of such events are for instance when the C-Network manager was invited to attend prestigious events from the automotive industry along the side of large players in the industry. The managers from B-network, F-Network and E-Network expressed the request from the network partners of having their interests commonly represented by the network in order to influence policy, and develop new markets. The manager from G-Network in fact also attempted to influence policy, by addressing letters to the BMWi informing them of the problems occurring in the industry due to policy decisions. Given that, representation activities were appreciated and requested by the network partners, it is safe to conclude that external representation activities will be positively related to Present Value. In fact, smaller organizations have reportedly sought out linking themselves to larger organizations in order to increase their legitimacy (Baum et al., 2000; Stuart, 2000). The following proposition is therefore derived:

G9-External representation activities are positively related to present value.

Finally, looking at the co-occurrence matrix, it is apparent that for the concept of External Representation the largest co-occurrence value is concerning Partner Expectations. For some of the analyzed networks, the External Representation activities were directly related to the future goals of the network. For instance in the case of A-Network, external representation of the network was performed in order to assist with the networks business development and therefore directly contribute to the success of the commercialization projects. In this case, the activities are well aligned with the network vision (Müller-Seitz,

2012; Still et al., 2014). The same situation arises with F-Network and E-Network: In these networks, one of the network goals was to influence policy, and therefore the external representation activities are aligned with the network vision, giving the network a sense of direction. The following proposition can therefore be derived:

G10-External representation activities are positively related to partner expectations.

The propositions G7 to G10 account for the most significant co-occurrence values in the matrix in Table 6.4. The exception being the high co-occurrence values between New Partner Acquisition and Social Mechanisms. However, given the fact that some network managers acquired new partners through existing strong personal connections governed by strong social mechanisms, it is not surprising that a co-occurrence is identified between these concepts.

A final observation from the analysis is that, according to propositions G7-G10 external activities do not seem to develop Social Mechanisms. Contrarily, all Internal Activities develop Social Mechanisms. Partner Engagement activities developed dyadic Social Mechanisms between network partners and the network manager, Interaction and Communication developed Social Mechanisms among network partners, and finally Collaborative Projects developed and strengthened Social Mechanisms among network partners. Given the fact that without hierarchical authority or complete contracts these kinds of networks are mostly governed through social embeddedness (Jones et al., 1997; Uzzi, 1997), for this reason it seems vital for the proper network development that, at least at network begin internal activities take priority in developing the network. This conclusion is well aligned with findings from Human and Provan (2000), in which a

network, which prioritized external development, collapsed, and a network that prioritized internal development did not. This finding has been repeatedly referred in more recent literature (Andrésen et al., 2012; Provan and Lemaire, 2012). Table 6.5 below shows the derived propositions in the empirically grounded conceptual framework.

Table 6.5 - Distribution of Propositions | Legend: “-” – No connection identified

	Present Value	Social Mechanisms	Partner Expectations
<u>Context</u>			
Institution	E1	-	E1,E3
Task	E2,E3	-	E2
<u>Design</u>			
Goals	F1	-	-
Structure	F3	F2	
<u>Operation</u>			
Internal Activities			
<i>Partner Engagement</i>	G1	-	G2
<i>Networking and Communication</i>	-	G3	-
<i>Collaborative Projects</i>	G4,G5	G6	-
External Activities			
<i>New Partner Acquisition</i>	G7	-	-
<i>New Information Acquisition</i>	G8	-	-
<i>Network Representation</i>	G9	-	G10

6.4 Network Strategy

The Oxford dictionary defines strategy as ‘a plan of action or policy designed to achieve a major or overall aim’. Under this definition, as a final step to analyze the management of the network cases, the strategies used by the network managers to create and develop the network will be discussed. The aim of this discussion is to identify a common pattern along choices regarding network design and network operation, and finally to see how these fit into the

network context. This analysis is based on findings from the cross-case matrix in Table 6.3. From the identified patterns, three different strategies were identified: Project Driven, Synergy Driven and Partner Base Driven. The following sections discuss these different approaches to creating networks. Table 6.6 presents a summary of the findings.

6.4.1 Project Driven Strategy

A project driven strategy was implemented by managers from more industrially oriented networks namely A-Network, C-Network and D-Network focused their network very specifically on addressing a concrete market opportunity. A-Network manager focused on reducing the costs of the installation of fiber-optic cables, C-Network manager focused on delivering a product to allow for the development of electric trucks, and finally D-Network manager was focusing on developing a concrete UV-paint printer based on highly efficient LEDs. The identified opportunity presented themselves due to a favorable task-environment. The opportunities were addressed through specific network goals of developing and commercializing a concrete product or service via a specific collaborative project. Since the network projects were very concrete, the network structure was designed considering the required core-competencies. The partners were therefore carefully selected taking into account the specific skills required to complete the project. Firstly, this strategy has the advantage that network partners have a concrete task in the network, thereby satisfying their needs. Secondly, since the partner competencies are supposed to complement each other, there is a very small risk of direct competition. On the other hand, the network structure will not be very resilient in the case a partner with a certain competency exits the network. Such was the case of D-Network

when the partner responsible for manufacturing the UV-printers lost interest in the network because of internal problems. In face of this, the network manager was forced to abandon this strategy completely, in order to avoid the network to collapse. It can also be the case that network partners with the desired competency are not acquired into the network in the first place. Since the network goals are closely dependent on successfully developing the common project, the network will be very dependent on its successful implementation. The outcome of D-Network is an example of a consequence of such a strategy. Networks that successfully implemented this strategy, namely A-Network and B-Network had high levels of network partner commitment. Activities related to this strategy are mainly focused on the concrete projects. For A-Network, no distinction was made between network meetings and project meetings. In addition, partner acquisition was performed with the sole goal of getting end-users into the network that could assist in developing the project further. Although not as much as with A-Network, C-Network also focused network activities on the network projects. C-Network created and developed around the main EAX project. Albeit, network meetings were also held in order to develop projects for new product and services related to the electric vehicles theme. The main project, and the involved partners, was however always the main spotlight of the network.

6.4.2 Synergy Driven Strategy

The Synergy Driven approach to creating networks was adopted by other network managers such as the managers from E-Network, F-Network and G-Network. These managers did not focus on a concrete opportunity, but were more concerned in developing a complementing partner structure with similar

interests in the same theme. The network goals were therefore less focused on a single opportunity, but in developing many projects in a certain area, such as smart-grids, unmanned aerial systems or wind power. The strategy behind these networks was to develop environments where networking would allow for a quick identification of potential synergies and later development into R&D projects. On the plus side, a network created with such a strategy is more resilient when a partner exits, because the network goals are not dependent on a single project. Therefore, a situation as that which happened with D-Network will be more unlikely. Additionally, a more varied partner structure will most likely generate more ideas given the existence of more novel information (Ahuja, 2000). However, since no concrete market opportunity has yet been identified, the network is highly dependent on government R&D incentives. In fact, projects from E-Network were academically driven, and since UASs were regarded as a new technology, partners from F-Network were very much dependent on government incentives. Finally, G-Network partners were dependent on favorable institutional policies for the development of their R&D projects. A second negative aspect of such a strategy is that there is a large pressure to bring network partners into concrete projects quickly. As suggested by propositions B1 and B2 in Chapter Five,

Proposition B1: Network goals aligned with network partner's immediate business goals is positively related to network commitment.

Proposition B2: Practical problem solving activities are positively related to network commitment.

it is important to bring partners into projects quickly in order to increase the Present Value, and ensure commitment. Additionally, according to

proposition G6 from the previous section, collaborative project activities are vital for generating trust and rapport between the network partners. A network manager following this strategy that does not manage to develop concrete projects will therefore not fully develop the network. In terms of activities for this networking-driven strategy, emphasis is placed on developing a good partner structure, on facilitating interaction and communication and on brainstorming for collaborative projects.

6.4.3 Partner Base Strategy

The Partner Base strategy was implemented as a second measure, when the initial approach failed. This happened with B-Network and D-Network. Once forced to pivot their strategy, the network managers concentrated on bringing as many partners as possible into the network. The consequence was the development of a network with a large number of partners, and therefore lower network fees to upkeep the network administration organization (NAO).

As explained by the B-Network manager and D-Network manager, this strategy is based on their practical experience that when contacting SMEs to enter a network, only a very small part of them will actually show any interest and finally commit to becoming a network partner. Under this strategy, it is therefore important to frame the network as broadly as possible in order to appeal to as many potential partners as possible. B-Network manager purposefully framed the network very broadly to begin with in order to have a large potential partner base. D-Network manager, once he pivoted the network strategy, broadened the scope of the network from focusing only on UV-LEDs to focusing on LEDs active in all wavelengths, in order to increase his partner base.

The advantage of such a strategy is that firstly, a very large potential partner

base exists for acquiring new network partners. Secondly, different network partners can exit the network, without affecting the network much. Thirdly, given the larger number of different network partners, the influx of novel information is potentially higher. In B-Network, for instance this was accomplished, in part because the network manager also personally brought much novel information into the network. Conversely, in D-Network, according to the network partners, not much information exchange occurred between partners. On the negative side, this strategy does not guarantee that network partners will be complementing each other, or that direct competition will not occur. For this reason, it will prove even harder to generate collaborative projects in the end. Given the potential complications that can arise between the network partners, it is possible that trust is hard to build. In fact, without collaborative projects or fruitful networking sessions, with high exchanges, it proves harder to develop social mechanisms.

Accordingly, both B-Network and D-Network partners did not regard the levels of trust in the network as particularly high. In terms of activities related to this strategy, in order to generate a critical mass of network partners, according to the network managers, focus must be given on new partner acquisition. B-Network manager put much emphasis on advertising the network and subsequently engage with the network partners in order to establish a personal relationship with them. According to this manager, some partners entered the network mainly because established rapport between the two. On the other hand, the D-Network manager acquired new network partners based on a different process. Namely, by assisting them in developing and locating funding for concrete R&D projects. As a condition for this service, the network partner would

enter the network. The partner would then be satisfied with this service and gladly take part in the network. For this strategy, it is therefore important to engage with each network partner and address the partners' personal needs. The table below (Table 6.6) sums up the different strategies with their strengths and weaknesses.

Table 6.6 - Network Creation and Development Strategies

	Description	Strengths	Weaknesses
Project Driven	<ul style="list-style-type: none"> -Task environment presents concrete opportunities -Network Goal related to concrete opportunity -Network structure focused on specific partner competencies -Activities focused on project development and execution -Mostly industrially focused 	<ul style="list-style-type: none"> -Partners have a concrete task in the network -Future of the network is concrete -Social mechanisms developed during concrete problem solving 	<ul style="list-style-type: none"> -Low resilience to partners exiting the network -May prove hard to acquire the required network partners -May have suffer from low novel information over time
Synergy Driven	<ul style="list-style-type: none"> -Institutional policy environment presents incentives for networking and project development -Network goal related to innovations in particular field -Network structure focused on creating a competition free environment with complementing partner competencies -Activities focused first on networking and later on project development -Mostly scientifically focused 	<ul style="list-style-type: none"> -Network is flexible and more resilient to the exit of partners -Good environment to generate ideas and collaborative innovation projects -Social mechanisms developed initially through networking and later through projects 	<ul style="list-style-type: none"> -Pressure to quickly create projects -Depending on the field may prove hard to get a good partner structure -Low resilience towards shifts in policy incentives
Partner Base Driven	<ul style="list-style-type: none"> - Institutional incentive for representing industry - Industry is fragmented and requires representation -Network goal very broadly related to particular field -Network structures focused on obtaining most number of network partners -Activities focused on advertising the network, acquiring new partners and engaging with the network partners individually -Can be scientifically or industrially focused 	<ul style="list-style-type: none"> -Larger potential partner base to acquire -Potentially greater influx of novel ideas provided network partners are willing to exchange information openly 	<ul style="list-style-type: none"> -Potential danger of internal network competition -May not have good structure for networking and project development -High pressure to create concrete projects -May not have conditions to allow for the development of social mechanisms

6.5 Conclusion

Employing a cross-case display, and based on the codes and code co-occurrences, this chapter identified several propositions regarding how the network commitment drivers can be influenced by network management. In

order to classify the management of the network across all cases systematically, a framework was created dividing the accounting for network context, network design, and network operation. This framework was constructed based on extant literature, and findings from the cases. The present chapter concludes the explanatory part of this thesis. Based on the design science methodology, the goal of the next chapter will be to develop a prescriptive framework for the creation and development of top-down innovation networks. This framework will be based on previously existing literature, and the propositions developed in Chapter Five and Chapter Six.

Chapter 7 - Design Propositions – For Network Creation and Development

The goal of this chapter is to address RQ3 by developing a framework for the creation and development of top-down innovation networks from the findings derived in Chapter Five and Chapter Six. The practical applicability of the knowledge is accomplished by following the main principles from design science paradigm (Hevner and Chatterjee, 2010; van Aken, 2004), namely relevance, rigor and evaluation. Firstly, the practical relevance of the importance of network commitment is confirmed through a focus group, aimed at uncovering the main problems in network creation and development, held with network managers (Section 7.1) Rigor is guaranteed by deriving the design propositions from the findings and discussions developed through the research design described in sections 3.2-3.5. Finally, the validation of the design propositions is accomplished through validation with network experts (Section 7.3).

This chapter is structured as follows. Firstly, the focus group employed to confirm the practical relevance of creating networks with high levels of network commitment is presented. Secondly, the design propositions are presented as a framework for creating and developing networks, according to the described contexts and goals. The design propositions are based on the findings, and discussions from Chapter Five and Chapter Six. Finally, this chapter discusses the evaluation of the design propositions. The method employed for validation is expert interviews with various network managers.

7.1 Practical Relevance Assessment – Focus Group

The methodology followed to perform the focus group was based on the

recommendations by Krueger and Casey (2009). The goal of the focus group was to identify the main challenges faced by the network managers, and confirm the practical relevance of creating networks with high network commitment. A focus group is a suitable data-gathering instrument when trying to determine organizational concerns or organizational issues (Krueger and Casey, 2009). In this case, the goal was to identify the main concerns the network managers faced when managing their networks. The group consisted of network managers from all over Germany, tasked with managing networks active under the ZIM-NEMO incentive program. Assembled individuals were therefore suitable to deliver insights from the issue at hand. The following section characterizes the focus group setting in detail.

7.1.1 Focus Group Setting

The focus group was piggybacked on an already existing event held in the south of Germany on the 09.10.2013. The event had the goal of bringing network managers together and promote discussion and exchange of experiences they had in managing each network. According to Krueger and Casey (2009) piggybacking on other events may be a successful strategy when trying to get a national perspective on a particular subject, particularly when dealing with people from identical professions.

The meeting was held at a company in the south of Germany, which served as a neutral location where network managers could come together and freely discuss their concerns. All network managers were managers from different networks created under the ZIM-NEMO policy program. In total, there were ten different managers present at the meeting, which is a suitable number of focus group participants (Krueger and Casey, 2009). It is important to mention that no

government officials connected to the ZIM-NEMO program were present at this network manager meeting. Additionally, no entities were present that could be regarded as evaluators on behalf of the network managers. The setting for the focus group was therefore favorable to promote self-disclosure. Furthermore, the primary researcher, which was not in a position of power or great influence, was the moderator of the focus group.

As mentioned previously, attention was focused on the specific question placed to the network managers: “What are your main concerns when managing your networks?” As desired by good practices, this question is clear, short and open-ended (Krueger and Casey, 2009). The pause and probe technique was successfully employed in order to increase the conversation-flow (Krueger and Casey, 2009). As support materials, a flip chart was initially used in order to help categorize the addressed topics, and reduce redundancy. Furthermore, large post-it sticker were subsequently used to allow adding detail to each of the topics addressed on the flipchart. A photo of the flipchart can be seen in Figure 7.1. A better quality image of the flip chart can be seen in appendix VI. Additional data was gathered with notes made immediately after the focus group ended.



Figure 7.1 - Focus Group Support Material: Flipchart and post-its – Final

7.1.2 Focus Group Outcomes

When the purpose of the focus group is narrow, an elaborate analysis is not only unnecessary, but also even unappropriated according to Krueger and Casey (2009). The goal was to identify the largest concerns faced by the network managers when analyzing their networks. The methodology used to identify the data was therefore simply to identify the key issues and concepts phrased by the network managers.

The network managers expressed three different types of problems: **1-** Convincing the partners in joining the network; **2-** Capitalizing on the network projects; **3-** Establishing networking and synergies among the network partners; and finally **4-** Guaranteeing network commitment among the network partners. Each of the problems will be described next in greater detail.

1-The problem of initially convincing the network partners to join the network stemmed firstly from the fact that it was hard to demonstrate to the companies especially SMEs what were the concrete advantages for joining the network in the first place. According to the focus group participants, the added value is at times unclear for the network partners. This problem has repeatedly been confirmed in the literature (Klerkx and Aarts, 2013; Olsen et al., 2012), and discussed in Chapter Five. Additionally to this point, explaining the different rules of the ZIM-NEMO policy incentive system was also a barrier in acquiring new network partners. These problems refer to difficulties existing in the New Partner Acquisition activity in the framework presented in Chapter Six.

2- The problem of capitalizing on the network activities refers to the difficulties some group participants expressed in bringing the R&D projects

quickly into the market and thereby generating sales for their network partners. The problem of delivering concrete outcomes aligned with the company's business goals is as discussed in Chapter Five as a main component of creating Present Value (Proposition B1, Chapter Five).

3- The problem of establishing networking and synergies among the network partners was a difficulty expressed by the network partners, especially when there is competition and insufficient complementarities are present in the network. This was a problem confirmed in B-Network and D-Network.

4- However, the problem that was most often addressed by the network managers was regarding the network partners not committing to the network over time. Network managers expressed greatest concerns regarding network partners exiting the network. The network not having enough interested partners to evolve into the sustained form of the network, at the end of the funded phase was also brought up considerably. Finally, the fact some network partners being less interested in participating in the network activities, meetings and workgroups was also a problem of greater concern. All these aspects are directly connected to lacking network commitment.

Solving the first three problems requires diving into detail regarding the activities of partner acquisition, management of an R&D projects, or orchestration of networking events, as is done for instance with the action research performed by Gausdal (2013). Addressing these problems in the design propositions is however beyond the knowledge scope developed in this thesis. It is however possible to verify that the development of network commitment is a very real problem not only for academia but also for practice.

From the outcomes of this focus group, it is therefore possible to conclude

that by focusing the target outcome of the design propositions as high network commitment, the practical relevance of the propositions is guaranteed.

7.1.3 Limitations of the Focus-Group

The conduction of these focus groups has one major limitation, when taking into account the recommendations expressed by Krueger and Casey (2009). According to the authors, the number of focus groups should be around three to four, while in this case only one focus group session was employed. The employment of more than one focus group has some benefits. Firstly, this allows for dividing the focus group according to different participant type, and then perform a cross-group analysis. And secondly, multiple sessions allow to better establishment – and determine the establishment – of theoretical saturation (Krueger and Casey, 2009).

In the present study, no relevant differences among the participating network managers were established that would justify the need to establish different focus groups that would yield different opinions. Regarding the second use of focus groups however, it can be in fact argued that having been performed more focus group sessions, which more problems could have been identified. For the purpose of this study however, it was possible with only one focus group to confirm that developing networks with highly committed partners is in fact a problem with high relevance for practice. The following section therefore develops design propositions focused on the outcome of networks with high network commitment.

7.2 Design Propositions

This is accomplished by delivering a prescriptive framework for the creation and development of top-down innovation networks with high network commitment. Based on the knowledge derived in the previous chapters, the framework foresees two distinct general initial network goals and matching network contexts. On the one hand, a concrete network goal addressing a opportunity from the task environment. On the other hand a more overarching network goal to be achieved in a favorable institutional environment.

As explained in section 7.1 the design propositions will be shaped according to the CIMO-logic suggested by Denyer et al. (2008). The advantage of this being that firstly, a systematic structure for the propositions is developed, and secondly all main components of design propositions are explicitly described in the propositions themselves, namely the context in which the proposition should be applied, the desired outcome, the intervention itself, and the generative mechanisms, which explain the outcome (Denyer et al., 2008).

From the focus group, the target outcome of the design propositions was established as a network with highly committed partners. The generative mechanisms, defined by van Aken (2005, p26) as “*the answer to the question: ‘Why will this intervention in this context produce this outcome?’*” will be framed according to the drivers for network commitment identified in Chapter Five. The interventions will be based on evidence from the case studies presented in Chapter Four, and based on the framework developed in Chapter Six. Finally, the context in which each design proposition are applied shall be based according to the initial network environment and the initial network goals, also discussed in Chapter Six. Table 7.1 presents the high-level framework for the design propositions in the CIMO-logic. The following section introduces the network

contexts.

Table 7.1 - General Framework for CIMO-logic Propositions

Context	Interventions	Mechanisms	Outcome
Based on network environment and initial network goals. Presented in sections 6.3.2 and 6.3.4	Based on the knowledge regarding the management framework and connection to drivers in Chapter Six and Chapter Four	Based on the identified drivers for network commitment identified in Chapter Five	Identified based on research questions Chapter Three , and confirmed via the focus-group section 7.1 and thesis scope

7.2.1 The Context

Previous literature contends that networks should not be created with a one-size-fits-all approach (Brenner and Schlump, 2011; Eickelpasch and Fritsch, 2005; McAdam et al., 2006). Considering this, different contexts were identified, in order to target the interventions from the design propositions more accurately. The contexts used for the CIMO-logic propositions are based on the environmental contexts and initial networks goals identified in the framework in Chapter Six. From Chapter Six, initial favorable conditions for creating a network were mainly two: 1) a favorable task environment with a concrete network opportunity for a collaborative project (project-driven), or 2) a favorable institutional environment with adequate policy incentives for creating a network aiming at identifying synergies and developing projects (synergy-driven). This distinction finds consistency in the literature. For example, Paquin and Howard-Grennville (2013) for instance present a network that was developed under favorable institutional conditions, albeit no concrete opportunities were yet identified at network beginning. Contrastingly, Ritala et al. (2012) present the case of the Finish Mobile TV Community (FiMTV) that had the concrete goal to develop and commercialize Digital Broadcasting Video – Handheld (DBV-H) technology. Given that, the best approach for creating networks varies for the

above-described cases, different design propositions are created for each of them. If neither a favorable institutional environment nor a favorable task environment are present, then the onus of this thesis is to not recommend building an innovation network.

In the fortunate case that the planned network environment features both a favorable task environment and a favorable institutional environment, then propositions from both contexts are applicable. In the analyzed cases, networks that had favorable task environments had less problems than networks that did not. As discussed in Chapter Five and Chapter Six, a favorable task environment allows for the establishment of stronger Present Value and positive expectations (Proposition E2, Chapter Six). Therefore, given the case of the existence of a favorable task environment along with an additional favorable institutional environment, it is recommended to take advantage of the design propositions for the task environment context.

Apart from the initial context in which the innovation networks are created, managers also need to know if the network is being created, or has already been established and needs to be developed. Clearly, it does not make sense to apply the same interventions to a network being freshly created and an existing network in need for additional development (Paquin and Howard-Grennville, 2013; Popp et al., 2014; Ritala et al., 2012). In line with the previous rational, regarding the design science propositions, additionally to the distinction between the different contexts, a distinction shall be made between network creation and network development.

The design propositions for the network creation phase are to be followed if the innovation network is currently being created - i.e. if no activities exist in

the network, no social mechanisms are established in the network context, and the network does not yet possess a shared identity. Design propositions for the network development phase are to be followed if the innovation network is already function according to the basic requirements defined in the design propositions for the network creation phase. While the goal of the design propositions for network creation is to establish the minimal conditions for managing the innovation network, the design propositions for network development aim to address the long-term pitfalls that the network may encounter, as happened for instance with C-Network when it started running out of interesting themes. The table below (Table 7.2) sums up the different contexts considered for the design propositions. The following section discusses and describes the propositions based on the identified contexts.

Table 7.2 - Design Proposition Contexts

Environmental context and Goals	Favorable task environment with concrete opportunity for collaborative project		Favorable institutional environment with policy incentives for the creation of a synergy-driven network	
Network stage	Creation	Development	Creation	Development
Context Type	Context A	Context B	Context C	Context D

7.2.2 Design Propositions

The goal of this section is to present, describe, and discuss the design propositions applicable to network contexts introduced in the previous section. The expected outcome of successfully applying these design propositions is the creation or development of innovation networks with committed network partners.

First, the design propositions for both the creation and the development of project-driven - Contexts A and B - innovation networks are discussed. This is followed by the discussion of designed propositions related to synergy-driven innovation networks – Contexts C and D. Finally, four design propositions applicable to both contexts are presented and discussed.

7.2.2.1 Project-Driven Networks - Contexts A and B

The main goal of the design propositions for creating a project-driven network is to establish the minimal conditions for creating an innovation network around a large – previously identified - collaborative project. The identification of the project is beyond the scope of this research.

As seen with C-Network and A-Network a major requirement is having a good distribution of core competencies in the network, so that each partner is specifically suited to tackle a concrete task to advance the collaborative project. The advantage of this is the network partners working on concrete tasks related to network activity. This has been shown, by this research and previous studies (Lefebvre et al., 2014; Olsen et al., 2012; Proposition B2, Chapter Five) to contribute towards a higher perception of value of the network. The following design proposition is therefore derived:

Design Proposition DP-A1: In order to create a project-based network with highly committed partners, ensure the network brings value to the partners, by selecting the partner structure according to concrete tasks required for the main project.

Having established a solid network structure, it is important to take advantage of the project tasks to build working relationships between the network partners. As shown from the evidence of the cases, and as indicated by

supporting research, social mechanisms are best built through joint concrete problem solving (Brenner et al., 2013; Meyerson et al., 1996; Noteboom, 2002; Proposition G6, Chapter Six. It is therefore proposed that these projects be used to promote teamwork:

DP-A2: In order to create a project-based network with highly committed partners, ensure good social mechanisms - such as trust and reciprocity - develop between the network partners by promoting close collaboration during the execution of project tasks.

Since R&D projects normally deliver results in the long-run, companies in particular might be less committed if advantages for business are not immediately evident. Especially in SMEs, due to smaller amount of resources these long-term network goals may be overshadowed by current everyday business (Batternick et al., 2010). Identifying, and maintaining end-users interested in the R&D projects helps to align the network goals with the everyday business goals. This has the advantage of increasing the Present Value of the network and therefore increasing the commitment towards the network activities (Proposition F3, Chapter Six). The following design proposition is therefore derived:

Design Proposition DP-A3: In order to create a project-based network with highly committed partners, ensure increase Present Value, by identifying and approaching multiple end-users that are interested in the project outcomes.

Once the network has been created according to the above-described propositions, the base conditions for the project-driven network have been met. Assuming that the project-driven network is successfully managed, the network manager will have created a strong network core of committed partners that are

very well aligned in pursuing their common goals. However, there is the need to ensure that the network will develop positively, and not wither and die in the long-run, once the collaborative project has been concluded. The following design propositions are targeted at mitigating the problems that might arise down the road in an innovation network created through a project-driven approach.

Over time networks, especially particularly focused networks, may lose value for their network partners due to decreased novelty in the network (Proposition B2, Chapter Five). In the analyzed case for instance, after some time, the network partners complained that networks had lower novelty, and dried up of interesting themes. Networks that are too closely knitted together have the problem of becoming too heterogeneous and stagnating due to lacking information inputs (Klerx and Aarts 2013). According to proposition (Proposition G7, Chapter Six) bringing new partners into the network increases novel knowledge and thus the value for network partners. This is supported by literature on knowledge diversity and structural holes (Ahuja, 2000). The following design proposition is therefore derived to develop the project-driven innovation network:

Design Proposition DP-B1: In order to develop a project-based network with highly committed partners, increase the Present Value with new network ideas and information, by acquiring new partners into the network.

In order to integrate the new network partners and new ideas in the network, social mechanisms must be developed between the new and older network partners. Additionally, while the new partners are not yet integrated in concrete projects, it is important to demonstrate Present Value for them by

providing them with valuable information (Proposition G8, Chapter Six). For this purpose, building networking events on the existing network momentum may prove an interesting intervention to develop social mechanisms and create value for new and existing partners. The following design proposition is therefore derived.

Design Proposition DP-B2: In order to develop a project-based network with highly committed partners, ensure value and social mechanisms among new and existing partners, by promoting larger networking events with interesting presentation.

Finally, given the new themes brought into the network, it is necessary to find a new overarching vision for the network. A future common goal helps bring network partners together, especially in cases of a more heterogeneous network (Abrams et al., 2003; McAllister, 1995; Still et al., 2014). Engaging with the network partners and providing them with a future common vision helps develop positive Future Expectations; thereby increasing network partner commitment (Proposition D2, Chapter Five; Proposition G2, Chapter Six). This brings the following design proposition.

Design Proposition DP-B3: In order to develop a project-based network with highly committed partners, ensure positive future expectation, by engaging with the network partners and providing them with a strong common future goal.

7.2.2.2 Synergy-Driven Networks – Contexts C and D

While some innovation networks can be created based on a concrete project or opportunity from the task environment, other innovation networks can be created based on particular institutional environment that allows bringing

network partners together and identifying synergies, in order to crystalize concrete projects further down the line. In such cases, networks can be created with the main goal of identifying synergies between network partners that may be brought together under a larger overarching goal. The following design propositions are indented to assist in the development of synergy-driven networks.

As identified in previous chapters when designing the network, direct competing partners are to be avoided as they can diminish network partner commitment out of fear of invested knowledge being used by competitors outside the network scope (Schrack and Whitford, 2011; Sol et al., 2013; Proposition F2, Chapter Six; Proposition C3, Chapter Five). Additionally, it is important to bring into the network partners that can complement each other well (Paquin and Howard-Grenville, 2013). A higher complementarity of network partners makes it easier to generate ideas, identify network projects and therefore adds value to the network. This translates to the following design proposition.

Design Proposition DP-C1: In order to create a synergy-based innovation network with highly committed partners, ensure initial value and a favorable environment for the development of social mechanisms, by selecting a partner structure with low competitors and high amount of complementing partners.

When facing a network where the immediate value can be lower than in a project-based network, it is very important to balance future expectations (Olsen et al., 2012; Proposition G2, Chapter Six). In addition, it is especially important to bring the partners together under a future common goal, so as to unite the network partners (Still et al., 2014). This delivers the following proposition.

Design Proposition DP-C2: In order to create a synergy-based innovation

network with highly committed partners, ensure positive future expectations, by engaging early with the network partners and providing them with a strong common future goal.

Regarding the activities being performed in a synergy-driven network it is very important to add immediate value to the network partners, while concrete projects have not yet emerged. This can be done by focusing in bringing new information into the network regarding for instance the state of the art of the industry, or market information (Proposition G8; Chapter Six; Proposition B3, Chapter Five). This is summed up in the following design proposition.

Design Proposition DP-C3: In order to create a synergy-based innovation network with highly committed partners, add value to the network, by bringing new ideas and information into the network.

The main pressure in a synergy-driven innovation network is to identify the potential collaborations among the network partners. For this reason, it is important to have various networking events, where partners can exchange information, develop and refine ideas collaboratively and identify point of common interest (Gausdal et al., 2013; Paquin and Howard-Grennville, 2013). This allows for increased Present Value (Proposition G4, Chapter Six) and the development of initial levels of rapport and trust among the network partners (Proposition G3, Chapter Six).

Design proposition DP-C4: In order to create a synergy-based innovation network with highly committed partners, add value and develop social mechanisms – rapport and trust -, increasing networking among partners and project identification.

Once the basic requirements for this kind of network have been established,

initial synergy opportunities and collaboration ideas should become readily identifiable. However, in order for the innovation network to adequately develop and not collapse after a short amount of time, additional steps must be taken. The following propositions are therefore intended for freshly created synergy-driven innovation networks, looking to develop with committed network partners.

The main problem of synergy-driven networks is that after some time, due to lacking concrete projects network partners may start abandoning the network (Olsen et al., 2012; Proposition G4, Chapter Six; Proposition B2, Chapter Five). It is therefore important to, as soon as possible, concretize the opportunities and projects into collaborative projects. It is with the concrete projects that the network will develop adequate value and social mechanisms among the network partners (Proposition G4, Chapter Six; Proposition G6, Chapter Six). This brings the following design proposition:

Design Proposition DP-D1: In order to develop a synergy-based innovation network with highly committed partners, establish value and strengthen social mechanisms, by placing all network partners in concrete projects.

In networks with high institutional support, it is possible that there is not yet a concrete business opportunity from the task environment that has been identified regarding the exploitation of the R&D project. This can be even more so when dealing with innovation networks focused on an emerging technology. In order to develop present Present Value and positive future expectations it is of large importance to align the emerging collaborative projects with the task environment (Proposition B1, Chapter Five Proposition E2, Chapter Six).

Design Proposition DP-D2: In order to develop a synergy-based innovation network with highly committed partners, establish value and develop Future Expectations, by aligning concrete R&D opportunities with the industry.

7.2.2.3 Generally applicable Design Propositions

Finally, from the developed body of knowledge in Chapter Five and Chapter Six of the thesis, the following section presents four design propositions for developing innovation networks with committed partners that can be applied either when creating a project-driven network or a synergy-driven network. These design propositions consist in interventions that, according to the evidence, should increase network commitment in innovation networks, regardless of the context.

A large problem in creating an innovation network with partners that have no previous relationship with each other is the low amount of trust and rapport between them (Proposition C1, Chapter Five; Proposition C2, Chapter Five). The development of social mechanisms takes some time to develop in a network (Munoz Lu, 2011). For this reason when possible bringing together partners that either already have a good relationship with each other or at least with the network manager can help in developing strong social mechanisms and stronger network commitment.

Design Proposition DP-E1: In order to develop an innovation network with highly committed partners, ensure stronger social mechanisms, by recruiting into the network partners with previous working relationships.

As discussed in previous chapters, the alignment of business goals to the network goals makes it easier in obtaining commitment from the network

partners (Proposition B1, Chapter Five). While networking, exchanging information, developing ideas and working on R&D projects does not have an immediate return for the network partners business, the development of sales projects does. Therefore, although the main goal of an innovation network is the creation of new products and services, allowing for activities promoting sales of the partners' current products and services is expected to increase value and therefore increase the network partners' commitment (Proposition G5, Chapter Six; Lee, et al., 2010; Katzy et al., 2013).

Design Proposition DP-E2: In order to develop an innovation network with highly committed partners, ensure value for the network partners by developing sales activities parallels to the long-term project development.

Immediate value for the network partners can also be increased through external representation (Baum et al., 2000; Stuart, 2000; Proposition G9, Chapter Six). Additionally to this, representing the network partners together can help strengthen the future vision for the network thereby developing positive future expectations for the network (Müller-Seitz, 2012; Still et al., 2014; Proposition G10). The following design proposition is therefore suggested.

Design Proposition DP-E3: In order to develop an innovation network with highly committed partners, manage future expectations and increase Present Value, by jointly representing the network and the network partners amongst other companies and institutional bodies.

Given that network fees are a very common requirement for network membership in these kind of networks, it is important to address this adequately. Previous research states that the committing of resources is a sign of network commitment (Doz et Al., 2000; Provan and Lemaire, 2012). Albeit, this study

finds that some network partners can view the network fee as service purchase. In such cases, the network partner may adopt a more passive stance, because he is expecting services in return for his network fee (Proposition D3, Chapter Five). It is therefore advisable that network management makes clear to the network partner that the network fee is a contribution, and part of the overall required network effort, not a payment for services to be rendered. This results in the following design proposition:

Design Proposition DP-E4: In order to develop an innovation network with highly committed partners, manage the Future Expectations, by ensuring partners understand network fees are an additional form of contribution and not a service fee.

7.2.2.4 Using the design propositions

Based on the descriptions of the contexts in section 7.3.1, the decision-chart below (Figure 7.2), presents an overview of how to use the design propositions when creating or developing a network.

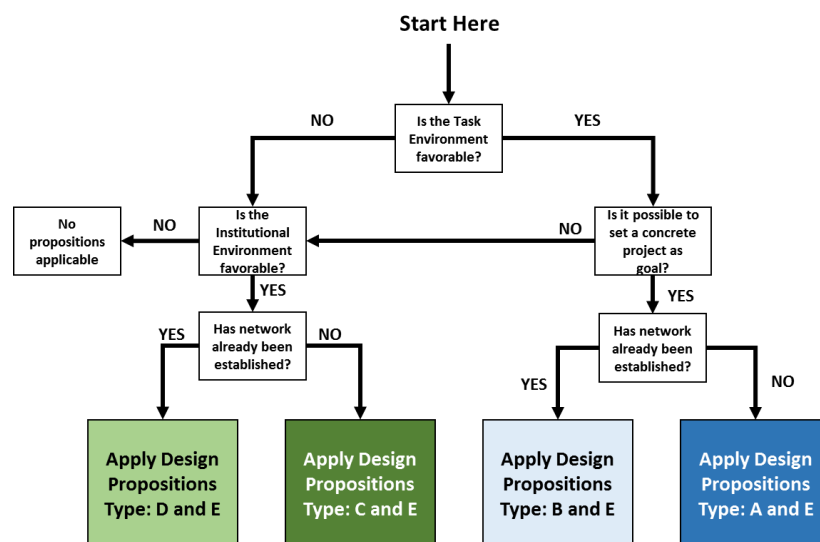


Figure 7.2 - Decision Flow Chart for Applying Design Propositions

Finally, based on the network management framework from Chapter Six,

the table below sorts the design propositions according to what the interventions affect. While most interventions affect the internal activities and the external activities, some affect the network design. Finally three design propositions deal with the alignment of the network and its environment, namely A-3, D-2 and E3. The following section presents the validation steps taken for the framework.

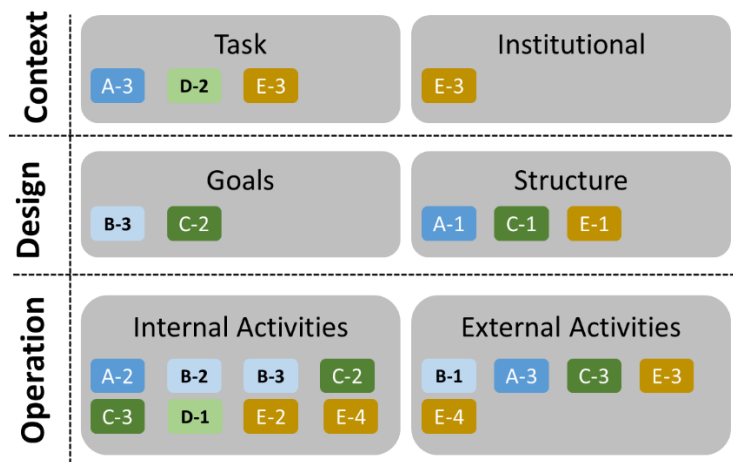


Figure 7.2 - Design Propositions Sorted According to Intervention

7.3 Evaluation

The evaluation of the design propositions in the field would require their application in new network settings – regarding both network creation and development – along with the assessment of network commitment over time, in order to evaluate the impact of the interventions. Based on the case studies used for this research, the timeline for such an assessment would be at least three years and thus impractical.

However, other evaluation methods can be selected in such cases. Hevner et al. (2004) in their discussion of the use of design science for information systems research argue that the evaluation phase is a very important albeit flexible component of design science research. The authors state that “the evaluation of designed artifacts typically uses methodologies available in the

knowledge base” (p.86, Hevner et al., 2004).

Following this rationale, in the case of the present study, the methodological knowledge base for case-study research should be applied. As such, expert opinion has been widely accepted as a form of validation of findings and of obtaining higher construct validity (Yin, 2009). Based on this, the design propositions were evaluated based on interviews with experts from 12 network managers. Six interviewed network managers were responsible for managing networks created under the ZIM-NEMO incentive system, and the other six managers had experience managing networks created under a different policy incentive, namely the COMPETE program for developing clusters in the Portuguese industry. It is important to stress that none of the network managers previously interviewed for the cases were invited to validate these propositions. This allows for an increased the external validity of the design propositions (Yin, 2009).

During the interviews, the network managers were initially introduced to the drivers presented in Chapter Five, and the framework presented in Chapter Six. Next, the network managers were introduced to the different network contexts, and asked to rate the effectiveness of each design proposition in each context. Finally, they were asked to comment if they thought any major aspects were not being addressed by the propositions. The support materials used for these interviews are presented in appendix VII.

The results of the expert’s assessment of the design propositions in presented in Table 7.3.

Table 7.3 - Validation Summary

	Design Propositions																
Experts	A1	A2	A3	A4	B1	B2	B3	C1	C2	C3	C4	D1	D2	E1	E2	E3	E4
DE1	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2
DE2	2	2	2		2	2	2	2	2	2	2	2	2	2	1	2	2
DE3	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2
DE4	2	2	2		2	2	2	2	2	2	2	2	2	2	1	2	2
PT1	2	2	2	2	2	2	2	1	2	2	2	2	2	-1	2	2	2
PT2	2	2	2	2	2	2	2	1	2	2	2	2	2	-1	2	2	2
PT3	2	0	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2
PT4	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
PT5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PT6	2	2	2	1	2	2	1	2	1	1	2	1	2	2	1	1	2
PT7	2	2	1	1	2	1	2	2	1	2	2	2	2	2	0	2	2
PT8	2	2	2	2	2	1	2	1	2	2	2	2	1	2	2	2	2
Nº of Disagree / Str Disagree	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0

| Legend: 2 – Strongly Agree, 1 – Agree, 0 – Neutral, -1 – Disagree, -2 – Strongly Disagree |

Initial validation was performed with network experts experienced with networks created under the ZIM-NEMO context. Feedback concerning the design proposition was very positive, with most of the interviewees selecting ‘Strongly Agree’. Accordingly, no changes were performed to the design propositions. Concerning the interviewees experienced with innovation networks in Portugal, the first validation interview was performed with PT1 and PT2. Although most propositions were strongly agreed with, there were some comments nonetheless. The first major comment was that the design propositions for the project driven network creation lacked a design proposition accounting for the need to transform the opportunity into a common goal. Although the need to transform a concrete opportunity was implied in the project-based network, a new proposition was added to exclude any room for future misinterpretation.

Design Proposition DP-A4: In order to create a project-based network with highly committed partners, ensure increased Present Value and positive expectations by selecting a common network goal aligned with the concrete R&D opportunity.

Additionally to this feedback, it was suggested that the design proposition E1 would be reformulated. According to the experts, the design proposition could imply that it could be advantageous to bring two highly connected networks together, that had no connections with each other. This in their view would be a misinterpretation of the design proposition. The design proposition was altered to accommodate this feedback. This reformulation maintains consistency with findings from the cases, albeit assures it is not open to more general interpretation.

Design Proposition DP-E1: In order to develop an innovation network with highly committed partners, ensure stronger social mechanisms, by recruiting into the network, partners with previous working relationships to current network members.

Finally, some concerns were raised from few experts regarding design proposition C1. According to the network experts, in some cases it is not possible to shape the partner structure at will, for instance when the network-fostering policy does not allow the network manager to forbid the entrance of network members because of internal network competition. This is however mostly a problem for initiatives for clusters representing a region or industry. This proposition was however not reformulated. Since the design proposition states a recommendation, it is implied that it only should be applied where possible.

Resulting feedback from the network experts was positive. Design

Propositions A2, E1, and E2 were evaluated as 'neutral' once each. The network experts that gave this evaluation did not disagree with the design propositions, however they stated that could not corroborate the proposition from personal experience. By interviewing network experts from other contexts than the ZIM-NEMO program from cases A-G, the external validity of the propositions is extended. The final design propositions are available in appendix VIII.

7.4 Conclusion

This chapter uses the DSR principles to transform the findings of previous chapters into design propositions, useful to the management practice of innovation networks. Firstly, this chapter confirms the practical relevance of network commitment for network managers through a focus group. Secondly, the chapter develops design propositions for the creation and development of top-down innovation network. Finally, the present chapter validates the design propositions with network experts, thereby confirming the design propositions and increasing external validity of the study. Minor changes in the final design propositions reflect feedback from the network experts.

Chapter 8 - Conclusion and Future Work

This chapter presents the conclusions by summing up the main findings of the work, and explaining how they contribute towards academia and practice. Limitations of the study are also presented, along with some recommendations for future studies, building on the work presented throughout this thesis.

8.1 Implications for Theory and Practice

The goal of this thesis was to explore the drivers of network commitment in top-down innovation networks and to understand how these drivers can be affected by network management. Finally, a prescriptive framework for the creation and development of networks was derived. Motivation for this research question was the indication from previous research that network commitment was associated with network sustainment.

Firstly, this research confirms that network commitment is in fact associated with network sustainment in top-down innovation networks. Chapter Five concludes that the cases which demonstrated highest levels of network commitment were also the networks that evolved into a sustained form. Networks with the lower levels of network commitment ended together with the underlying policy incentive.

Chapter Five additionally concludes that three main drivers are responsible for the development of network commitment in top-down innovation networks, namely the present value the network has for the network partners, the social mechanisms (free riding, trust and macro-cultural norms) and the future expectations that the partners have regarding the network. Through a discussion of the literature, findings in the form of propositions are developed for each of

the three concepts. These propositions adequately address research question 1 and lead towards a greater understanding of network commitment, which was considered in its infancy by extant literature.

Chapter Six addresses the identified knowledge gap of the role of network management in targeting network commitment as the main dependent variable. This chapter starts by creating a framework for network management based on the literature and on findings from the cases. Subsequently, Chapter Six builds on the three concepts identified in Chapter Five and identifies how management influenced these concepts in the case studies. Outcomes from this analysis are propositions linking network commitment to network management. These findings adequately address research question 2, address the identified knowledge gap regarding how network management can affect network commitment and address the gap related to how top-down innovation networks can be adequately created and developed. Finally, three strategies for network creation are identified based on the network case studies.

Chapter Seven is mainly directed at practitioners and provides prescriptive guidelines and a decision chart to be used for the creation and development of top-down innovation networks. Although the prescriptive guidelines are derived from the case studies and discussion of the literature, validation with network experts active in clusters has been successful. This indicates that the guidelines maintain validity beyond the context in which the network cases evolved. The extensible validity and practical applicability of the guidelines is an important outcome of this research, especially since it has been pointed out that research on networks tend to have anecdotal practical relevance.

The present study has several implications for theory and for practice.

Regarding previous studies focusing on network commitment, this study provides a solid basis confirming that network commitment is strongly linked to network resilience and sustainment, as was contended by Kramer et al. (2013) and Kramer (2014). Furthermore, this research adds knowledge with regard to the way in which network goals and partner structures are defined and to those activities which can be set up differently and still result in higher network commitment. This leads to an increased knowledge on how network commitment can be shaped in a network. The two cases featured in the work by Anderson et al. (2012) share many similarities with the cases studied for the present research. For instance the description of how long-term business goals may have increased commitment in one of the analyzed networks (Andrésen et al., 2012). However, the larger number of cases in the present research allowed for richer information, which resulted in concrete propositions and recommendations regarding how to increase commitment in top-down innovation networks.

Secondly, this research clearly states how networks can be created in different ways. The interplay between internal network development and external network development was first addressed by Human and Provan (2000) and has since been repeatedly referred to (Popp et al., 2014; Provan and Lemaire, 2012). By focusing on more than two cases, this research finds that balancing internal and external network management is important for network development. Chapter Six does, in fact, conclude that external activities alone are not suited for developing the social networks which, according to Wincent et al. (2013), are the basis for embeddedness controls on the network. This is, however, provides only a partial explanation. The context in which the network is being

created should be considered when creating and developing networks. This may warrant relying more on external activities than on internal ones. Furthermore, the nature of activities that are performed under the network – either internal or external – are of importance for network development. Of greater significance for policy makers of innovation networks is the higher commitment obtained in networks pursuing joint sales activities, in addition to R&D activities. It follows that policies aimed at promoting innovation networks should also promote other activities in parallel to those more closely associated with innovation, namely match-making events and development of R&D projects. According to this research, policies aimed at promoting innovation networks should not only focus on fostering innovation between partners, but also on promoting ‘healthy’ networks.

A final question that may be the focus for future debate is what happens after a network has become sustained by committed network partners. Since it is not expected that a network will be sustained by its partners indefinitely, the question of network life cycle comes to mind, and how the present research could fit into it. The practice-oriented literature review by Popp et al. (2014) distinguishes between the networks’ emergence, growth, maturity and death. Under this life-cycle scope, this research focuses on how top-down networks may cross from the emergence to the growth phase. Some of the analyzed networks made the transition to the next network phase, while other did not manage to cross this chasm.

8.2 Limitations of the Study

This research design is not without its limitations. First, the longitudinal study focuses on networks developed under a specific policy in German industry.

While this does present some favorable conditions for an embedded case study, by diminishing variability of the economic-political environment, it does limit the ability to generalize from the findings. To mitigate these limitations, discussion with the literature was performed when developing the propositions, and furthermore validation was performed with experts from different network contexts. Finally, this work realizes that the assessment of the network commitment driver through the participation of network partners in meetings may be subject to imperfections. A partner may for instance be committed to a network, and participate in its activities remotely, without attending the meetings. Furthermore, a network may have a large amount of strategic partners that are supposed to appear “by name only” on the network roster on purpose in order to increase the networks external legitimacy. Despite this, the qualitative assessment of network commitment is aligned with the assessment of network commitment base on network meeting attendance, which indicates that impact from the mentioned hypothetical imperfections of the assessment of network commitment would be anecdotal.

8.3 Future Work

Firstly, an important future work of this study directly related to the findings would be to perform survey research to better assess the connections between the concepts of Present Value, Social Mechanisms or Future Expectations and the concept of network commitment. Future work would consist in operationalizing the concepts of Present Value, Social Mechanisms and Future Expectations and quantify their correlation with the concept of network commitment. The work by Kramer (2014) and Clarke (2006) already feature a good amount of items that can be used to operationalize the concept of network

commitment for survey research.

Secondly, this section calls on further research on the role of network fees and their connection to network commitment and sustainment. This suggestion stems from proposition *D3: Network fees are negatively related to network commitment.* and the corresponding design proposition *DP-E4: In order to develop an innovation network with highly committed partners, manage the future expectations, by ensuring partners understand network fees are an additional form of contribution and not a service fee.* Although both in the literature, and among discussion with research colleagues these statements do not hold much resonance, when validated by the practitioners these propositions were regarded as ‘extremely important’, which indicates a gap in academic understanding of the concept of network fees in networks. Related to the network fees aspect it would be interesting to understand how the business model from the NAO relates to the network’s performance. Are there any different business models that can be implemented? Although most NAOs are non-profit, the services and fees they practice to generate income most likely have an important impact on the network.

Thirdly, regarding the network context, it would be interesting to understand if contexts or industries favor a particular type of network. While this PhD does deliver some findings regarding this aspect, it may prove interesting to conduct studies, which take the environment as the unit of analysis.

Finally, it would be interesting to see similar research designs applied to networks created and develop under different contexts in order to better ascertain the generality of the findings.

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Appendixes

I – Interview Guidelines 1 Manager

II – Interview Guidelines 1 Partner

III – Interview Guidelines 2 Manager

IV – Interview Guidelines 2 Partner

V – Conceptual Mapping

VI – Focus Group Flip Chart

VII – Support Material for Assessment

VIII – Final Propositions

I – Interview Guidelines 1 Manager

Guidelines
Target Interviewee : Network Manager Interview Duration: 60-90 mins Document Version: 03_FINAL
General Questions
<ul style="list-style-type: none"> • Date and time of Interview • Name of Interview and Network • Area of Responsibility • What is the Network Managers Previous Work experience?
Main Questions to Interviewee
<ol style="list-style-type: none"> 1. Why was this network created? 2. How were you contacted to manage the network? 3. What was the network goal at the time of creation? 4. What was the network Structure? 5. What were your initial expectations from the network? 6. What is your current experience in the network? 7. What are the most important tasks when managing the network? 8. What were the main events that influenced the network? <ol style="list-style-type: none"> a. At the beginning at the network? b. Especially positive events? c. Especially critical events? 9. What actions did you undertake when facing the network events? <ol style="list-style-type: none"> a. What happened as a consequence? 10. How did the network partners react to those events? 11. What, in your opinion, is important to secure a larger commitment among the network partners? 12. What, in your opinion, is the biggest threat to securing commitment among the network partners? 13. What do you think will be the future of the network?
Follow-up Questions / Request for Information
<ul style="list-style-type: none"> • Network Projects • Additional project documents • What pre selection of interesting Partners would you recommend for interview?

II – Interview Guidelines 1 Partner

Guidelines
Target Interviewee : Network Partner Interview Duration: 5-10 mins Document Version: 02_FINAL
General Questions
<ul style="list-style-type: none">• Date and time of Interview• Name of Interview and Network• What is the Network Partner Previous Work experience?• Company's core competency
Main Questions to Interviewee
<p>14. Are you currently participating in other networks?</p> <p>15. How is the experience?</p> <p>16. What is your knowledge regarding networks?</p> <p>17. How where you approached regarding this network?</p> <p>18. What were your initial expectations regarding this network?</p> <p>19. What is your experience so far?</p> <p>20. What, in your opinion, are Critical Issues to the network?</p> <p>21. Would you do something differently?</p> <p>22. In your experience, what differentiates a good network from a bad one?</p>

III – Interview Guidelines 2 Manager

Guidelines
Target Interviewee : Network Manager Interview Duration: 60-90 mins Document Version: 06_FINAL
General Questions
<ul style="list-style-type: none">• Date and time of Interview• Name of Interview and Network• Area of Responsibility• What is the Network Managers Previous Work experience?
Main Questions to Interviewee
<p>23. General Regarding Networks</p> <ul style="list-style-type: none">a. Could you talk to me regarding your experience in inter-organizational networks?b. What makes a network work?<ul style="list-style-type: none">i. What, in your opinion, is important to secure a larger commitment among the network partners?ii. What, in your opinion, is the biggest threat to securing commitment among the network partners?c. What are, in general the goals and risks related to participation in a network? <p>24. Network Goals</p> <ul style="list-style-type: none">a. Why was this network created?b. How were you contacted to manage the network?c. What was the network goal at the time of creation? <p>25. Network Structure –Horizontal vs Vertical</p> <ul style="list-style-type: none">a. What kind of partner types do you have in the network?<ul style="list-style-type: none">i. Vertical?ii. Horizontal? <p>26. Network Management</p> <ul style="list-style-type: none">a. What were your initial expectations from the network?b. What are the most important tasks when managing the network?c. What are the most time-consuming tasks?d. What are the biggest challenges facing the network at the moment? <p>27. Network Events / History</p> <ul style="list-style-type: none">a. What were the main events that influenced the network?<ul style="list-style-type: none">i. At the beginning at the network?

- ii. Especially positive events?
 - iii. Especially critical events?
- b. What actions did you undertake when facing the network events?
 - i. What happened as a consequence?
- c. How did the network partners react to those events?

28. Interactions (Relationships)

- a. How are your interactions with network partners? (*Relationship with partners*)
 - i. 3 highest problems regarding partners
 - ii. Examples?
- b. How do network partners interact with each other? (*Relationship among partners*)
 - i. R&D Projects, Commercialization, Knowledge;
 - ii. Relationships, trust, competition.
 - iii. How does this influence your actions?
 - iv. How does this, in your opinion, affect network success?

29. Challenges and Benefits

- a. What, in your opinion, are the most common challenges for your network partners?
- b. What, in your opinion, are the most common benefits for your organization in this network?

30. Commitment for network success

- a. How can, in your opinion, a network partner contribute towards the success of a network?
 - i. Are there examples of this in this network?

31. General

- What do you think will be the future of the network?
- What do you believe are the biggest obstacles for a successful network?
- What do you believe are the largest factors for a successful network?

Follow-up Questions / Request for Information

- Network Projects
- Additional project documents
- What pre selection of interesting Partners would you recommend for interview?

IV – Interview Guidelines 2 Partner

Guidelines
Target Interviewee : Network Partner Interview Duration: 20-30 mins Document Version: 05_FINAL
General Questions
<ul style="list-style-type: none"> • Date and time of Interview • Name of Interview and Network • Area of Responsibility • What is the company's core competency? • Is it a SE, SME or Research institute?
Main Questions to Interviewee
<p>32. General Regarding Networks</p> <ol style="list-style-type: none"> Could you talk to me regarding your experience in inter-organizational networks? (<i>Internal Legitimacy Assessment: Network as a Form</i>) What makes a network work? – (<i>Internal Legitimacy Assessment: General / Drivers</i>) <ol style="list-style-type: none"> What, in your opinion, is important to secure a larger commitment among the network partners? What, in your opinion, is the biggest threat to securing commitment among the network partners? What are, in general the goals and risks related to participation in a network? <p>33. Goals and Expectations</p> <ol style="list-style-type: none"> Why was this network created? Why did you enter this network? What was the network goal at the time of creation? How are your goals related with network goals? <ol style="list-style-type: none"> What were your initial expectations from the network? What is your current experience in the network? <p>34. Network History / Events (<i>Drivers</i>)</p> <ol style="list-style-type: none"> What were the main events that influenced the network (<i>Re-phrase from point of view of interviewee's organization if question is too overwhelming</i>)? <ol style="list-style-type: none"> At the beginning at the network? Especially positive events? Especially critical events? How did these events influence the network? How did these events influence your organization (Contrasting events?)? How did management react to those events?

- e. How did other network partners react to those events?

35. Interactions (*Relationships / Social Capital*)

- a. How do you interact with other network partners? (*Relationship with partners assessment*)
- i. R&D Projects, Commercialization, Knowledge;
 - ii. Relationships, trust, competition.
- b. How do you interact with network management? (*Relationship with management assessment*)

36. Challenges and Benefits – (*Internal Legitimacy Assessment: Satisfaction of own interest / Drivers*)

- a. What are the most common challenges for your organization in this network?
- b. What are the most common benefits for your organization in this network?

37. Commitment for network success – (*Internal Legitimacy Assessment: Positive Pressure for network success*)

- a. How can, in your opinion, a network partner contribute towards the success of a network?
- i. What actions have you taken to ensure network success?
 - ii. Would you take any further actions / make investments if required?

38. General

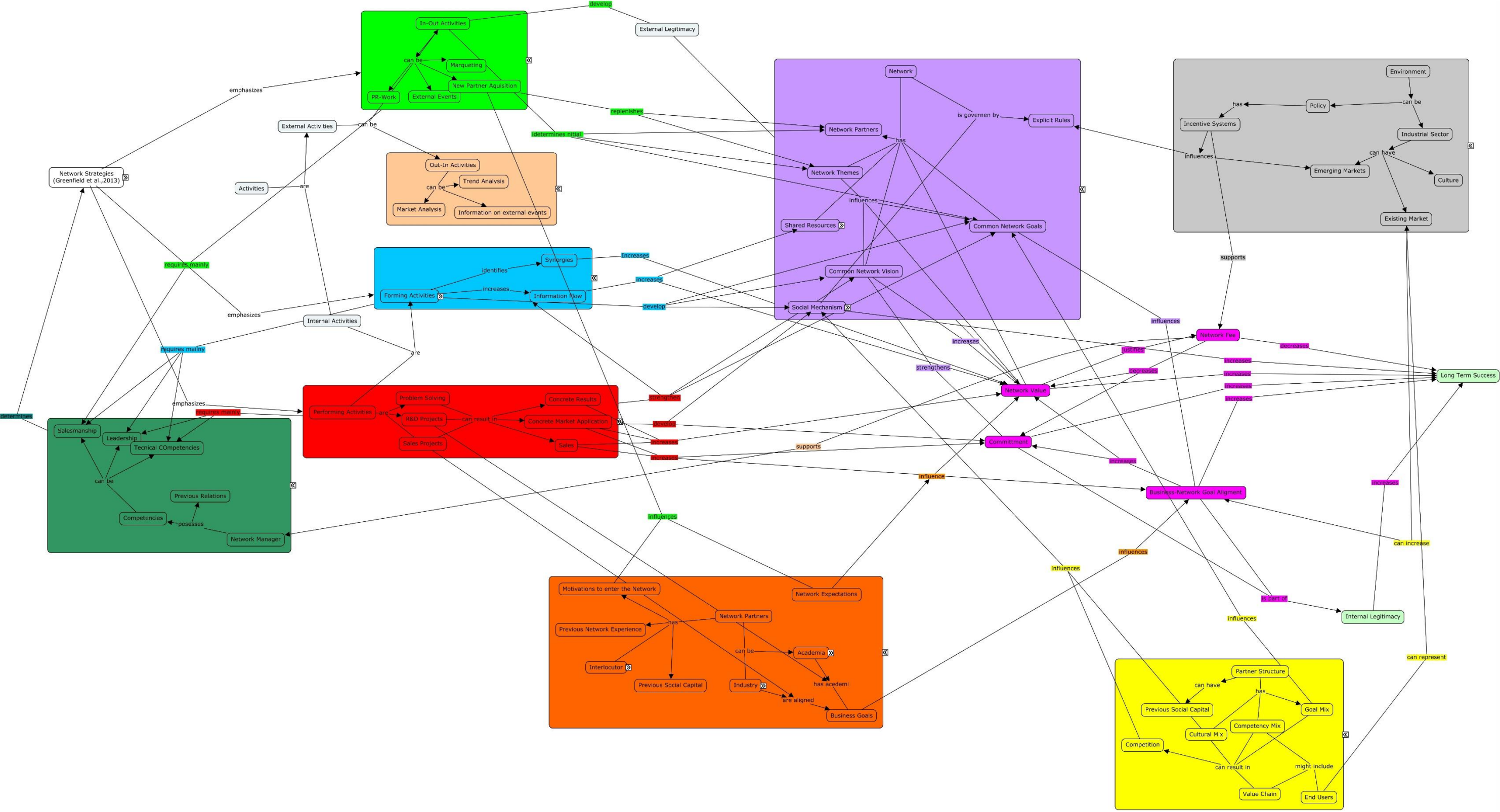
- a. What do you believe are the biggest obstacles for a successful network?
- b. What do you believe are the largest factors for a successful network?
- c. What do you think will be the future of the network (*Use as cooling off*)?

Wrap-Up Interview

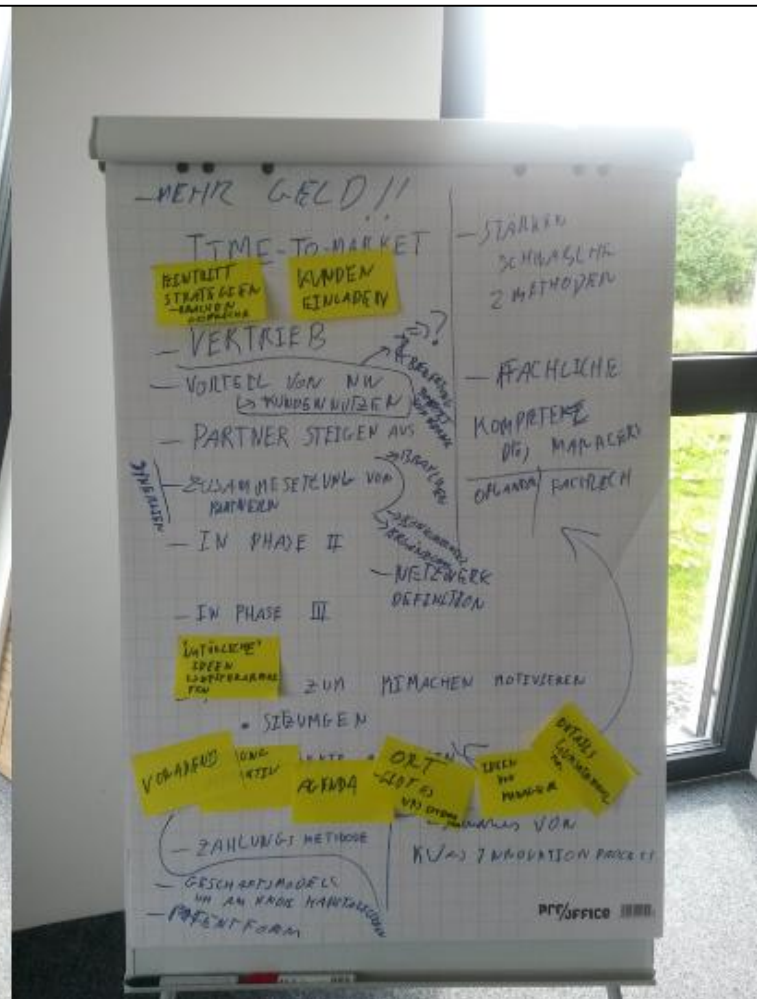
Follow-up Questions / Request for Information

- Network Projects
- Additional project documents

V – Conceptual Mapping



VI – Focus Group Flip Chart



VII – Support Material for Assessment

Assumptions: Favorable industrial environment
with concrete R&D opportunity

Create a network with committed partners by:

A1 – Select a common network goal aligned with concrete R&D opportunity, thereby ensuring value and future expectations

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

A2 – Select partner structure according to concrete tasks, thereby ensuring the network brings value to the network partners

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

A3 – Promote close cooperation between project tasks, thereby developing strong social mechanisms among partners such as trust and rapport

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

A4 – Identify and approach multiple end-users, thereby ensuring future expectations and increasing current value

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

Develop a network with committed partners by:

B1 – Engage with the network partners and broaden common future vision, thereby ensuring value and positive future expectations

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

B2 – Acquire new partners into the network with new competencies and information thereby increasing value for the network partners

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

B3 – Promote large networking events with interesting presentations, thereby ensuring value and developing social mechanisms among network partners

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	0

Assumptions: Favorable institutional environment
with incentives for industry/technology

Create a network with committed partners by:

C1 – Engage early with network partners and provide common future vision, thereby ensuring positive future expectations

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	1

C2 – Where possible, select partner structure with low/no direct competitors and complementing competencies, thereby ensuring initial value and potential for developing social mechanisms

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	1

C3 – Deliver new ideas and information relevant to the network, thereby adding immediate value to the network

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	1

C4 – Develop ideas, and promote networking and match-making between partners, thereby adding value and developing social mechanisms.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	1

Develop a network with committed partners by:

D1 – Place network partners in concrete projects as soon as possible, in order to establish immediate value and strengthen social mechanisms among partners

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	1

D2 – Align concrete R&D projects / ideas with industry, in order to increase value and develop positive future expectations

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-4	-3	-2	-1	1

General Application

Develop a network with committed partners by:

E1 – Offer representation to network partners amongst other companies and political institutions, thereby increasing current value and future expectations

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
+2	+1	0	-1	-2

E3 – Recruit individual partners with previous relationships into the network, thereby ensuring stronger social mechanisms

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
+2	+1	0	-1	-2

E2 – Develop sales activities in parallel to other network activities, thereby increasing immediate value for the network partners

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
+2	+1	0	-1	-2

E4 – Ensure network partners understand network fees are an additional form of contribution and not a service fee, thereby adequately managing future expectations

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
+2	+1	0	-1	-2

VIII - Final Design Propositions

A - For Project Driven Approach: Creation

Design Proposition DP-A1: In order to create a project-based network with highly committed partners, ensure the network brings value to the partners, by selecting the partner structure according to concrete tasks required for the main project.

DP-A2: In order to create a project-based network with highly committed partners, ensure good social mechanisms - such as trust and reciprocity - develop between the network partners by promoting close collaboration during the execution of project tasks.

Design Proposition DP-A3: In order to create a project-based network with highly committed partners, ensure increase Present Value, by identifying and approaching multiple end-users that are interested in the project outcomes

Design Proposition DP-A4: In order to create a project-based network with highly committed partners, ensure increased Present Value and positive expectations by selecting a common network goal aligned with the concrete R&D opportunity.

B - For Project Driven Approach: Development

Design Proposition DP-B1: In order to develop a project-based network with highly committed partners, increase the Present Value with new network ideas and information, by acquiring new partners into the network.

Design Proposition DP-B2: In order to develop a project-based network with highly committed partners, ensure value and social mechanisms among new and existing partners, by promoting larger networking events with interesting presentation.

Design Proposition DP-B3: In order to develop a project-based network with highly committed partners, ensure positive future expectation, by engaging with the network partners and providing them with a strong common future goal.

C - For Synergy Driven Approach: Creation

Design Proposition DP-C1: In order to create a synergy-based innovation network with highly committed partners, ensure initial value and a favorable environment for the development of social mechanisms, by selecting a partner structure with low competitors and high amount of complementing partners.

Proposition DP-C2: In order to create a synergy-based innovation network with highly committed partners, ensure positive future expectations, by engaging early with the network partners and providing them with a strong common future goal.

Design Proposition DP-C3: In order to create a synergy-based innovation network with highly committed partners, add value to the network, by bringing new ideas and information into the network.

Design proposition DP-C4: In order to create a synergy-based innovation network with highly committed partners, add value and develop social mechanisms – rapport and trust -, increasing networking among partners and project identification.

D - For Synergy Driven Approach: Development

Design Proposition DP-D1: In order to develop a synergy-based innovation network with highly committed partners, establish value and strengthen social mechanisms, by placing all network partners in concrete projects.

Design Proposition DP-D2: In order to develop a synergy-based innovation network with highly committed partners, establish value and develop Future Expectations, by aligning concrete R&D opportunities with the industry.

E: For either approach: Development

Design Proposition DP-E1: In order to develop an innovation network with highly committed partners, ensure stronger social mechanisms, by recruiting into the network, partners with previous working relationships to current network members.

Design Proposition DP-E2: In order to develop an innovation network with highly committed partners, ensure value for the network partners by developing sales activities parallels to the long-term project development.

Design Proposition DP-E3: In order to develop an innovation network with highly committed partners, manage future expectations and increase Present Value, by jointly representing the network and the network partners amongst other companies and institutional bodies.

Design Proposition DP-E4: In order to develop an innovation network with highly committed partners, manage the Future Expectations, by ensuring partners understand network fees are an additional form of contribution and not a service fee.

